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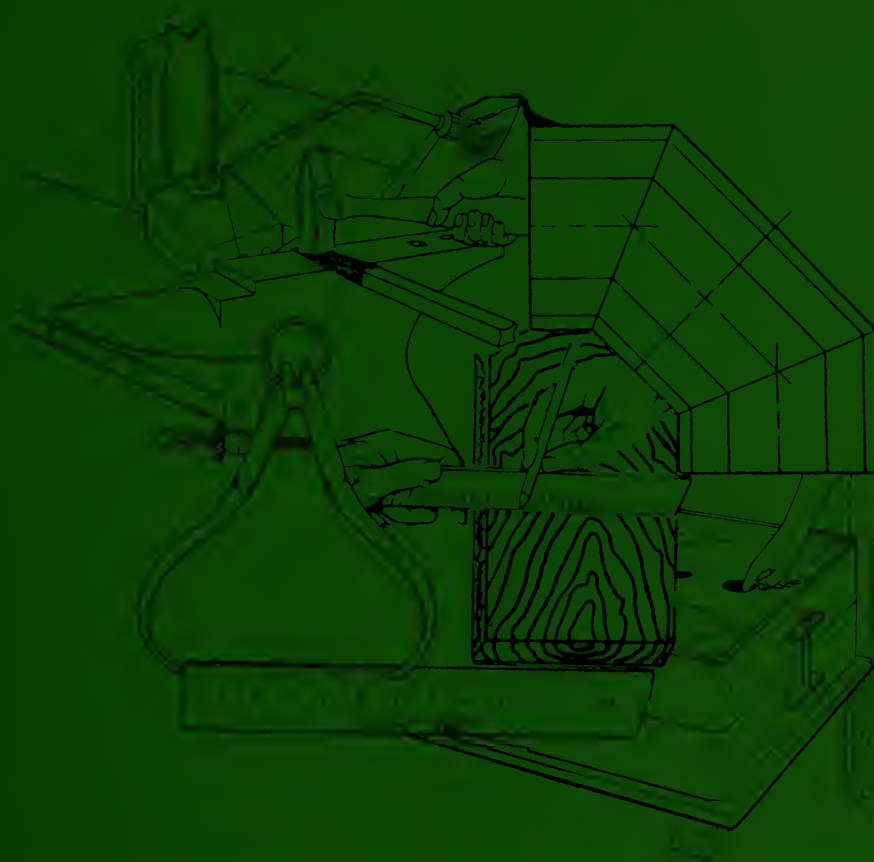
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**INDUSTRIAL EDUCATION 10-20-30**

# **MATERIALS**



**INDUSTRIAL EDUCATION**

1984

# **Curriculum**

**Alberta**  
EDUCATION



## ACKNOWLEDGEMENTS

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### INDUSTRIAL EDUCATION 10, 20, 30

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NOTE: This publication is a service document. The advice and direction offered is suggestive except where it duplicates or paraphrases the contents of the Program of Studies. In these instances, the content is in the same distinctive manner as this notice so that the reader may readily identify all prescriptive statements or segments of the document.

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NOTE:

Industrial Education 10, 20 and 30 is made up in four (4) packages according to career fields.

Teachers may select modules from a number of fields and consequently will need those packages that contain the content for the modules they plan to teach.

The packages are color-coded and contain the following career fields:

Electricity-Electronics	-	yellow
Materials	-	green
Power Technology	-	blue
Visual Communications	-	orange

The general modules of Research, Development and Production Science will be found in each package.

Study the content of the modules carefully and select those that best meet the needs of the students in the school, your own competencies and the availability of tools and equipment.

## INTRODUCTION

The Industrial Education 10, 20, 30 series of courses is designed to provide exploration of, and orientation to, a wide variety of career options. These courses provide guidance to students to help them select more in-depth courses for occupational preparation or simply add to their technological "know-how".

Through the program, students are able to work in an environment which is conducive to challenging their intellect and developing their talents in a number of technical and craft areas. Students become aware of the interrelationship and the dependency of one technology upon the others. They have the opportunity to develop an understanding of the principles and skills required in the various occupations. Students will have many opportunities to apply academic skills learned in other subjects to their lab work.

## RATIONALE

Industrial Education adds a new dimension to the program for educating young people at the secondary school level. For many students it will provide unique options to help prepare them for the life ahead while enjoying their current studies. The authors of the Industrial Education curriculum recognize that the needs of society have changed, and with them the approach to knowledge acquirement. Students today must be helped to discover how to learn, to conduct inquiry, to study independently, to make choices and decisions, to use technology, and to live with change.

The Industrial Education program is concerned with career development. Because careers today do not develop along predictable lines, our education program must provide considerable flexibility so that students have an option of several career choices. This is possible for several reasons. A person who has been broadly educated is able to learn what he needs to know, within limitations, about a new job. With the general education level of the society rising, the future worker needs broad as well as experience-based education. Such an education offers him/her subsequent chances for rapid and successful specialization. With this in mind the learning experiences should be such that they become the basis upon which specialization can be built.

Our task in the secondary school then, is to provide students not only with entry skills for several careers but to orient the program to meet social and cultural goals. This means that the various courses or disciplines must be interrelated. Industrial Education provides a unique opportunity for the teacher to demonstrate these relationships and further, to capitalize on them by means of the motivation created through practical applications. Thus the experiences to which students are exposed should provide them with realistic criteria for career guidance.

Industrial Education is a program consisting of courses that provide a continuum of experiences, starting with exploratory experiences and activities in the elementary and junior high school, expanding in the high school to the development of skills in career fields and culminating in on-the-job experience.

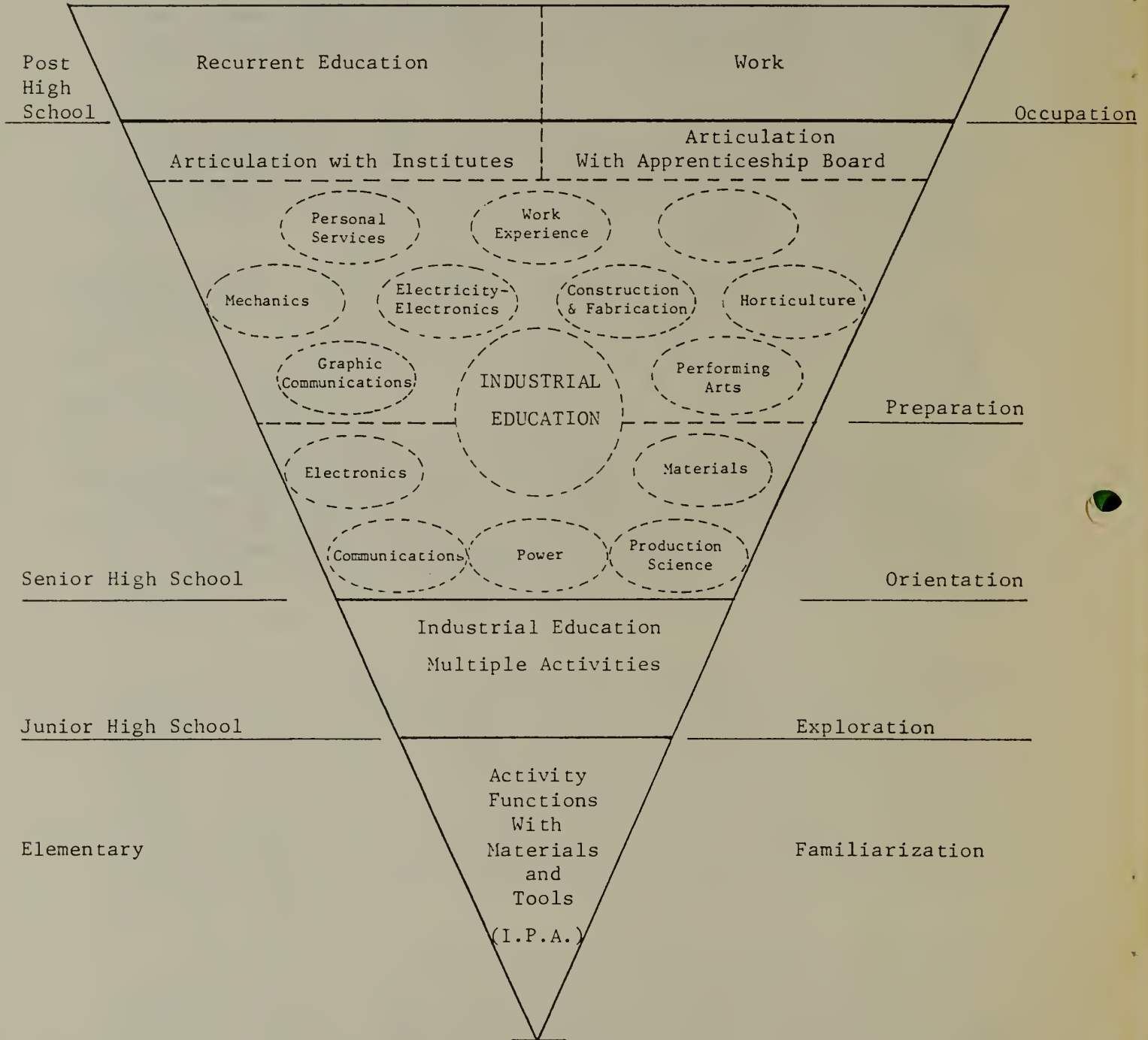
Industrial Education in the Junior High School, the exploratory phase of the continuum, provides the opportunity for the students to explore, reason, experiment and discover the reality of the technological society in which they live. The content of the program deals with industry, its organization, materials, processes, products, occupations, and the problems resulting from the impact of technology on society.

Following the exploratory phase, students may begin orientation studies in a career field. They may select modules of a more general nature in the Industrial Education 10, 20, 30 series or alternately take an introductory 12 course related directly to a career field. From here they advance to the more specific courses in the Industrial Education 22-32 program which prepare them for a career. The chart on the following page illustrates the Industrial Education Program in conceptual form, showing the advancement of a student from the awareness or familiarization stage to exploration, orientation, preparation and finally, an occupation. These courses provide in-depth experiences in the development of skills in tool and machine operation, material processes, drawing and interpretation and a knowledge of the basic concepts related to the technologies. All the courses place emphasis on practical work and applied theory.

ALBERTA INDUSTRIAL EDUCATION PROGRAM

FOR

CAREER CHOICE AND DEVELOPMENT



Legend: ————— Solid line indicates levels  
 - - - - - Broken lines and open spaces indicate opportunity to transfer to other options

## OBJECTIVES OF INDUSTRIAL EDUCATION

The Industrial Education Program can help achieve the Goals of Schooling and Education. The course objectives are more focused and give direction to the teacher.

The objectives of Industrial Education are classified in three areas with the following purposes:

### Personal Growth:

To provide opportunities for the individual growth of the student through the development of acceptable personal and social values necessary in a productive society.

1. To provide a technical environment which motivates and stimulates individuals to discover their interests and develop personal and social responsibilities.
2. To assist in the development of positive attitudes toward safety.
3. To assist in the development of positive attitudes toward conservation and environment.
4. To assist in the development of consumer literacy.

### Career Exploration:

To provide students with experiences which will assist him or her in making realistic career choices.

1. To provide students an opportunity, within a technical environment to become acquainted with the general occupational characteristics of a variety of career fields.
2. To relate their own interests, abilities, likes, dislikes and values to several career fields.

### Occupational Skills:

To develop basic competencies, integrating cognitive and psychomotor skills to enter a family of occupations.

1. To provide safe exploratory experiences in the use of tools, energy, equipment and materials appropriate to various technologies prevalent in a productive society.
2. To develop an understanding of the interrelationships of various technologies.
3. To provide a technical environment which permits students to synthesize their accumulated knowledge in the solution of practical problems, and to assist students to develop habits that will be conducive to the establishment of a safe environment.

### ORGANIZATION

#### Program Organization:

The Industrial Education 10, 20, 30 courses consist of 56 modules of content. The modules are categorized into career fields. Four career fields, i.e. Graphic Communications, Electricity-Electronics, Materials, and Power Technology have the content of their modules outlined in this guide.

#### 1. Regular Program

Courses may be created by arranging combinations of modules drawn from the fifty-six available modules. These should be selected carefully to meet the needs of the students while at the same time providing appropriate consideration to factors such as suitability of facilities, equipment availability, supply costs and teacher experience or training. Each course may be taught for 4 or 5 credits (100 - 125 hours). The content for each module may range from 25 - 33 hours. Four modules of 33 hours each would provide the necessary time for a five-credit course. Four 25-hour modules would meet the time requirements for a four-credit course. The selection and sequence of modules is left to the teacher's discretion.

Procedurally, students will register in a course made up of four modules. The first four modules taken by a student would normally be registered as Industrial Education 10A. The next four modules would become 20A and the third set of four modules would be 30A. If some students wished to enrol in further Industrial Education courses, the next course would become 10B, with 20B and 30B following. It would be possible for students to arrange different sequences of courses if it is thought advisable. For example, one sequence might be 10A, 10B, 20A, 30A, 30B; another might be 10A, 20A, 30A, 10B, etc. Sequencing of courses will be left to local authorities. Examples of courses are as follows:

IE 10A (4-5 credits)	IE 20A (4-5 credits)	IE 30A (5 credits)
IE 10B (4-5 credits)	IE 30A (4-5 credits)	IE 30B (5 credits)

## 2. Special Consideration

In schools where vocational courses are taught, teachers have the option of using content from the "12" courses to make up the 65 hours required as prerequisite to the "22" courses. That is, in a composite high school where unit shops are available, students could be scheduled into two shops for a total of 125 hours, e.g. Auto and Welding. They could then advance to a "22" course in either or both of the courses.

Students in the Industrial Education 10 program would be required to take two modules for 33 hours each, directly related to the "22" course for which they are earning the prerequisite. For example, a student would have entry to a "22" program by taking two closely related modules, plus two others:

e.g. Basic Woods (33 hrs.)	65 hrs. permit entry to
Building Construction (33 hrs.)	Building Construction 22
Architectural Drawing (33 hrs.)	
Basic Wiring (33 hrs.)	
Approximate Total 132 hrs. = 1 Industrial Education course	
(5 credits).	

## Facility Organization

The organization of the physical facilities is in part determined by the original plan. There are, however, adjustments that can be made in the layout by the teacher to accommodate his/her style of teaching. The number of students in the class affects the way the lab or shop is organized. While most of the shops in Alberta are designed for 16 to 20 students, a number of factors must be considered in the final assignment of class load. These factors include:

1. physical size of the shop or laboratory
2. type of student
3. amount of equipment
4. type of programming
5. type of course
6. training and experience of the teacher.

Safety of the student and the opportunity to obtain teacher contact are important considerations when class loads are determined.

## EVALUATION

Evaluation of student growth should be based on stated behavioural changes and specific criteria understood by the students. Allowance should be made for both self and teacher evaluation and, in some cases, peer evaluation. Evaluation should be based on the three domains of learning as follows:

Affective  
(Personal Growth)

Cognitive  
(Subject matter)

Psychomotor  
(Product)

## MODULE TITLES

The following are the titles of modules in the Industrial Education 10, 20, 30 course.

Electricity-Electronics (yellow package)

1. Basic Electricity and Electronics I
2. Basic Electronics II
3. Equipment Servicing
4. Logic Circuits
5. Computing Systems
6. Introduction to Computers
7. Computer Programming - Introductory

8. Computer Programming - Industrial Applications
9. Communications - Introductory
10. Communications - Systems
11. Electronic Design
12. Electronic Construction

Materials (green package)

1. General Woods
2. Building Construction (Frame)
3. Building Construction (Sub-Trades)
4. Cabinet Construction (Basic)
5. Cabinet Construction (Advanced)
6. General Metals
7. Sheet Metal
8. Machine Metal
9. Arc Welding
10. Oxy-Acetylene Welding
11. Foundry
12. Earths
13. Plastics
14. Textiles
15. Foods

Power Technology (blue package)

1. Conventional Heat Engines
2. Small Engine Repair
3. Small Engine Tune-Up and Troubleshooting
4. Mechanical Systems
5. Non-conventional Power Sources
6. Electrical and Electronic Systems
7. Electro Mechanical and Electronic Control
8. Appliance Repair and Troubleshooting
9. Automobile Maintenance
10. Fluid Power
11. Automobile Tune-up
12. Automobile Repair
13. Automobile Ownership

Visual Communications (orange package)

1. Introduction to Offset Lithography
2. Process Photography - Line
3. Process Photography - Halftone
4. Layout and Design
5. Topographical and Architectural Drafting
6. Relief Printing
7. Screen Process Printing
8. Black and White Photography - Basic
9. Black and White Photography - Advanced
10. Color Photography
11. Mechanical Drafting
12. Customer Service
13. Offset Printing Production

General

Three modules of a general nature also are available. These modules may be used by a student or group only once. These are:

1. Research module
2. Developmental module
3. Production Science module

## INTRODUCTION TO MATERIALS

The materials modules consists of content representing the major construction and fabrication materials and processes used in Canada. Construction and fabrication continue to be an important and necessary activity in our society.

There are fifteen modules of content which provide the students and the teacher with considerable choice in building the type of program best suited to the situation. Teachers should select modules utilizing the resources available and in harmony with the needs of their students.

The major concepts addressed in Materials Technology are: extraction and processing, shaping, fastening and finishing. In addition, nine concepts common to the total program are studied where appropriate in each module.

### 1. Consumer Awareness

- quality
- effective advertising
- specifications
- dollar value
- buying procedures
- availability
- parts
- serving

### 2. Environmental Implications

- time element (past, present, future)
- rates of consumption
- conservation
- alternatives
- pollution (land, air, water)

### 3. Graphic Interpretation

- schematic
- symbols
- drawing interpretation
- visuals
- technical drawing and interpretation

#### 4. Measurement

- British Engineering System (present English systems)
- System Internationale (S.I.)
- accuracy
- tools and instruments
- tolerances
- precision
- estimating
- approximating
- computations (including graphs, charts, interpolation)

#### 5. Career Information

- benefits
- unionism
- local opportunities
- job mobility (vertical, horizontal, geographic)
- future
- retraining and upgrading
- jobs vs. careers

#### 6. Societal Implications

- time (past, present, future)
- economic
- life patterns
- status
- values and mores

#### 7. Technological Implications

- costs, benefits, consequences (C.B.C.)
- resource use and abuse
- tool development and use
- manufacturing
- servicing
- obsolescence
- design process
- planning

#### 8. Safety

- unsafe conditions
- unsafe acts

#### 9. Historical perspective

- the historical development of the discipline

## COURSE CONTENT

### MATERIALS

#### Introduction

The modules as listed may be selected in the order that the teacher finds most appropriate. Two modules taught for a total of 65 hours will serve as a pre-requisite for the appropriate "22" courses in Building Construction, Machine Shop, Sheet Metal and Welding.

#### Objectives

The objectives of the modules in Materials are:

1. To make the student aware of the variety of career areas represented by the materials area.
2. To give the student an opportunity to practise processes and skills required to construct with materials.
3. To give the student an opportunity for analytical thinking in planning and constructing or fabricating a project.

#### Learning Resources

- \*Miller, H.G., Hand and Machine Woodwork (Metric) Gage Publishing, 1980.
- Landers, J.M., Construction-Materials, Methods, Careers, Goodheart-Willcox, Latest Edition.
- \*Feirer, J.L., Cabinet Making and Millwork, Chas A. Bennett Co. Inc. Latest Edition.
- \*Feirer, J.L., General Metals, McGraw-Hill Ryerson, 1976.
- Zinngrabe, C.J., Schumacher, F.W., Sheet Metal Machine Processes, Delmar Publishers, 1975.
- Zinngrabe, C.J., Schumacher, F.W., Sheet Metal Hand Processes, Delmar Publishers, 1974.
- Krar, S.R., St. Amand, J.E., Machine Shop Training, 3rd Edition, McGraw-Hill Ryerson 1977, c/w Machine Shop Operation - Visu-text.
- \*Pender, J.A., Welding, 2nd Edition, McGraw-Hill Ryerson, 1978.
- Smith, R.E., Patternmaking and Founding, McKnight Publishing, 1954.
- Brennan, T.J., Ceramics, Goodheart-Willcox Publishing, Latest Edition.
- \*Cherry, R., General Plastics, McKnight Publishing, 1969.

\*Refers to prescribed learning resources.

MODULE ONE  
GENERAL WOODS

Introduction

Wood continues to be a material of major importance in our industrial society. This module is designed to provide an introduction into the wide variety of activities associated with woodworking and to develop skills in the use of wood shaping tools and machines.

Objectives

The objectives of the General Woods module are to:

1. Develop an awareness of and insight into varied facets of wood-working industries.
2. Develop an awareness of the practical capabilities of tools, machines, and materials and to develop safe work habits in their use.
3. Provide opportunities for the student to develop some skill in the use of tools and machines.

Learning Resources

- \*Miller, H.G. Hand and Machine Woodwork (Metric Edition) 1980  
Gage Publishing.
- Wagner, Willis H. Modern Woodworking Goodheart-Willcox 1978.
- Groneman, Glazener Technical Woodworking (2nd Ed.) 1976  
McGraw-Hill Ryerson.
- Fryklund, Laberge General Shop Woodworking McKnight Publishing 1972.
- Rowland, Robert Woodworking Operation (Visutext) 1980  
McGraw-Hill Ryerson.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMGW

GENERALIZATION: The development and demonstration of student knowledge in safe tool, equipment and material use is important in the industrial education program.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	<p>The student will:</p> <ul style="list-style-type: none"> <li>- recognize unsafe acts and unsafe conditions</li> <li>- identify and list factors affecting safety in the work environment such as: <ul style="list-style-type: none"> <li>- dress and clothing requirements</li> <li>- location and use of fire extinguishers</li> <li>- safety guards and eye protection</li> <li>- storage of materials and supplies</li> <li>- student behavior</li> </ul> </li> </ul>		
2. Safety Program	<ul style="list-style-type: none"> <li>- participate in implementation of a safety program for the work environment</li> </ul>		
3. Safe Work Habits and Tool Operations	<ul style="list-style-type: none"> <li>- use tools and equipment in a safe manner</li> </ul>		
4. Accident Reports	<ul style="list-style-type: none"> <li>- identify the purpose of Accident report forms and follow the correct procedure for reporting accidents</li> </ul>		
5. Compensation	<ul style="list-style-type: none"> <li>- explain the basic function of benefits under the Workers' Compensation Act</li> </ul>		

NOTES:

TOPIC 2: EXTRACTION, PROCESSING AND IDENTIFICATION

IEMGW

GENERALIZATION: Raw materials must be harvested and processed to produce the stock from which useful products are manufactured.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources and Location</p> <p>2. Processing</p> <p>3. Identification</p>	<p>The student will:</p> <ul style="list-style-type: none"><li>- identify the sources of some of the more common wood materials used in the lab</li><li>- discuss the lumbering industry and its processing of wood products, such as:<ul style="list-style-type: none"><li>- dimension lumber</li><li>- plywoods and veneers</li><li>- by-product materials</li></ul></li><li>- explain the differentiation between hardwoods and softwoods (i.e. coniferous and deciduous trees)</li><li>- learn to identify and classify wood materials with regards to:<ul style="list-style-type: none"><li>- grain patterns</li><li>- cell structure</li><li>- weight</li><li>- color</li><li>- odour</li></ul></li></ul>		

NOTES:

TOPIC 3: PROJECT DEVELOPMENT

IEMGW

GENERALIZATION: The planning and design of projects is an integral element of the material production and utilization process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Planning and Design	<p>The student will:</p> <ul style="list-style-type: none"><li>- develop an awareness of designing products and produce a working drawing</li><li>- develop plans for completion of a woodworking project</li><li>- discuss and list the elements of design such as:<ul style="list-style-type: none"><li>- line</li><li>- form</li><li>- shape</li><li>- movement</li></ul></li></ul>		
2. Graphic Interpretation	<ul style="list-style-type: none"><li>- interpret various forms of graphic illustration such as:<ul style="list-style-type: none"><li>- working drawings</li><li>- schematics</li><li>- pictorial drawings</li></ul></li></ul>		

NOTES:

TOPIC 4: MEASUREMENT AND LAYOUT

IEMGW

GENERALIZATION: Accurate measurement and layout is imperative in the production of goods in our society.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Measurement	<p>The student will:</p> <ul style="list-style-type: none"><li>- demonstrate a working knowledge of measuring tools and instruments such as:<ul style="list-style-type: none"><li>- scribe</li><li>- dividers</li><li>- rules</li><li>- square</li><li>- trammel points</li><li>- marking knife</li><li>- pencil</li><li>- combination square</li><li>- marking gauge</li><li>- sliding T-level</li><li>- mortise gauge</li><li>- tape measure</li></ul></li></ul>		
2. Layout	<ul style="list-style-type: none"><li>- transfer graphic illustrations to project materials utilizing appropriate tools and instruments</li></ul>		

NOTES:

TOPIC 5: SHAPING, FORMING AND FASTENING

IEMGW

GENERALIZATION: Material are processed into useable forms through the utilization of various tool and machine processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Shaping Materials</p> <p>2. Forming Materials</p> <p>3. Combining Materials</p> <p>- fasteners</p> <p>- jointing</p>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- learn to identify and correctly use material removal tools and machines such as: <ul style="list-style-type: none"> <li>- planes and planing machines</li> <li>- hand and power saws</li> <li>- files and sanders</li> <li>- hand and power drills</li> <li>- routers and shapers</li> <li>- chisels and lathes</li> </ul> </li> <li>- develop a practical knowledge of abrasives, bending and lamination methods of forming materials</li> <li>- demonstrate the correct use of fastening devices such as: <ul style="list-style-type: none"> <li>- nails</li> <li>- bolts</li> <li>- screws</li> <li>- hinges</li> <li>- corrugated fasteners</li> <li>- staples</li> <li>- catches</li> </ul> </li> <li>- demonstrate an understanding of various wood joints such as: <ul style="list-style-type: none"> <li>- butt</li> <li>- dado</li> <li>- mitre</li> <li>- rabbet</li> <li>- lap</li> <li>- mortise and tenon</li> </ul> </li> </ul>		

TOPIC 5: SHAPING, FORMING AND FASTENING (continued)

IEMGW

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- adhesion	<ul style="list-style-type: none"> <li>- demonstrate a knowledge regarding various bonding materials and their application: <ul style="list-style-type: none"> <li>- glues</li> <li>- contact cements</li> <li>- adhesives</li> <li>- resins</li> </ul> </li> </ul>		

NOTES:

TOPIC 6: FINISHING

IEMGW

GENERALIZATION: Most products manufactured from wood have had a finish applied to protect their exposed surfaces and/or to enhance their appearance.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Preparation  2. Wood Fillers  3. Stains	The student will: <ul style="list-style-type: none"> <li>- identify and use the tools and materials available to prepare wood surfaces for a finish, i.e. scrapers, sandpaper, steel wools, abrasive compounds</li> <li>- describe when to apply wood fillers in paste or liquid form</li> <li>- apply wood stains according to accepted procedures</li> </ul>		

NOTES:

TOPIC 6: FINISHING (continued)

IEMGW

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Finishes	<ul style="list-style-type: none"><li>- discuss the varied final finishes such as:<ul style="list-style-type: none"><li>- shellac</li><li>- lacquer</li><li>- enamels</li><li>- varnish</li><li>- paints</li><li>- waxes</li><li>- oils</li></ul></li><li>- demonstrate the ability to apply various wood finishes</li></ul>		

NOTES:

MODULE TWO  
BUILDING CONSTRUCTION (FRAME)

Introduction

Climate dictates the need for substantial yet economical forms of shelter. This module is designed to introduce students to the area of wood-frame construction and its importance in structural systems.

Objectives

The objectives of the Building Construction (Frame) module are to:

1. Introduce the student to the concepts of planning, design and fabrication in wood-frame structures.
2. Provide the student with the opportunity to develop an understanding of the materials and tools utilized in frame construction.
3. Facilitate student conversion of structural plans and drawings to basic framing tasks.

References

\*Miller, H.G. Hand and Machine Woodwork (Metric Edition) 1980  
Gage Publishing.

Wagner, Willis H. Modern Carpentry Goodheart-Willcox 1979.

Wagner, Willis H. Modern Woodworking Goodheart-Willcox 1978.

CMHC Canadian Wood-Frame House Construction (Metric Edition).

Miller, H.G. Building Construction - Materials and Methods 1968  
MacMillan.

Cannon, K.F. and Hatley, F.G. Building Construction Technology  
McGraw-Hill Ryerson 1982.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMBC

GENERALIZATION: The development and demonstration of student knowledge in safe tool, equipment and material use is important in the industrial education program.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none"><li>- recognize unsafe acts and unsafe conditions</li><li>- identify and list factors affecting safety in the work environment such as:<ul style="list-style-type: none"><li>- location and use of fire extinguishers</li><li>- dress and clothing requirements</li><li>- safety guards and eye protection</li><li>- storage of materials and supplies</li><li>- student behavior</li></ul></li></ul>		
2. Safety Program	<ul style="list-style-type: none"><li>- participate in implementation of a safety program for the work environment</li></ul>		
3. Safe Work Habits and Tool Operations	<ul style="list-style-type: none"><li>- use tools and equipment in a safe manner</li></ul>		
4. Accident Reports	<ul style="list-style-type: none"><li>- identify the purpose of accident report forms and follow the correct procedure for reporting accidents</li></ul>		
5. Compensation	<ul style="list-style-type: none"><li>- explain the basic function of benefits under the Workers' Compensation Act</li></ul>		

NOTES:

TOPIC 2: PLANNING AND DESIGN

IEMBC

GENERALIZATION: Plans and working drawings are means of communication between designer and builders.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Structural Planning	<p>The student will:</p> <ul style="list-style-type: none"><li>- list and explain a number of building terms</li><li>- demonstrate a knowledge of the responsibilities of:<ul style="list-style-type: none"><li>- architect</li><li>- draftsman</li><li>- contractor</li><li>- owner</li></ul></li><li>- interpret scale drawings and blueprints of frame construction</li></ul>		
2. Design	<ul style="list-style-type: none"><li>- develop design techniques for wood-frame construction</li><li>- adhere to codes and regulations in design work</li></ul>		

NOTES:

TOPIC 3: CONSTRUCTION GUIDELINES

IEMBC

GENERALIZATION: Design, purpose and aesthetic appeal often determine material selection and utilization.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Types	The student will: <ul style="list-style-type: none"><li>- develop ability to complete basic framing techniques</li><li>- know the difference between platform, balloon, post and beam framing</li></ul>		
2. Environmental and Societal Influences	<ul style="list-style-type: none"><li>- examine the different types, styles and sizes of structures which may be built due to influences such as:<ul style="list-style-type: none"><li>- urban vs rural</li><li>- suburban</li><li>- socio-economic group influences</li><li>- utilization costs</li></ul></li></ul>		
3. Mass Production	<ul style="list-style-type: none"><li>- describe the effect of mass production on:<ul style="list-style-type: none"><li>- labor costs</li><li>- community benefits</li><li>- cost factor influences</li><li>- environmental factors</li></ul></li></ul>		

NOTES:

TOPIC 4: MATERIAL UTILIZATION

IEMBC

GENERALIZATION: Materials must be selected, measured, cut, shaped and assembled carefully and systematically.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Selection and Recognition	<p>The student will:</p> <ul style="list-style-type: none"><li>- demonstrate a knowledge of the most common materials found in frame construction:<ul style="list-style-type: none"><li>- dimension lumber</li><li>- plywood</li><li>- foundation materials</li><li>- insulations</li><li>- roofing</li><li>- vapor and moisture barrier materials</li></ul></li></ul>		
2. Shaping	<ul style="list-style-type: none"><li>- demonstrate how to shape materials by sawing, drilling, planing, chiselling</li></ul>		
3. Fastening, Joining and Bonding	<ul style="list-style-type: none"><li>- select and use mechanical fasteners such as nails, screws, dowels</li><li>- utilize various wood joints when applicable</li><li>- learn about the use of bonding agents in frame construction:<ul style="list-style-type: none"><li>- glues</li><li>- cements</li><li>- chemical bonding agents</li></ul></li></ul>		

NOTES:

TOPIC 5: MEASUREMENT AND LAYOUT

IEMBC

GENERALIZATION: Correct use of layout and measurement tools facilitate accurate utilization of building materials.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Tool Selection	The student will: <ul style="list-style-type: none"><li>- learn how to recognize and select specific measuring tools:<ul style="list-style-type: none"><li>- tapes</li><li>- rulers</li><li>- levels</li><li>- squares</li><li>- plumb bobs</li><li>- chalk lines</li></ul></li></ul>		
2. Tool Use	<ul style="list-style-type: none"><li>- demonstrate the ability to correctly use selected tools</li></ul>		
3. Accuracy	<ul style="list-style-type: none"><li>- become familiar with and recognize the importance of accurate layout and measurement in construction</li></ul>		

NOTES:

TOPIC 6: CONSTRUCTION METHODS

IEMBC

GENERALIZATION: Materials are combined by various methods to become integral units of the finished structure.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Component Assembly	<p>The student will:</p> <ul style="list-style-type: none"><li>- study and employ where possible methods of assembling, such as:<ul style="list-style-type: none"><li>- foundations</li><li>- joints and headers</li><li>- stair and fireplace openings</li><li>- beam construction</li><li>- bearing wall construction</li><li>- sub-flooring</li><li>- stud walls</li><li>- window and door openings</li><li>- partition walls</li><li>- ceiling joints</li><li>- rafters and trusses</li></ul></li></ul>		

NOTES:

MODULE THREE  
BUILDING CONSTRUCTION (SUB-TRADES)

Introduction

This module is designed to develop an understanding of the construction industry and its varied occupations. Program emphasis is directed toward acquainting students with the various fields in the sub-trade area and to formulate some general knowledge of the materials, tools and processes utilized in these fields. Concepts may be selected at the discretion of the instructor.

Objectives

The objectives of the Building Construction (Sub-Trades) module are to:

1. Introduce the student to the sub-trades concept and to develop an awareness of the wide range of opportunities in the materials/construction industries.
2. Expose the student to the wide range of materials used in the sub-trades.
3. Develop basic knowledge, attitudes and skill levels related to the construction sub-trades.

Learning Resources

- \*Landers, J.M. Construction - Materials, Methods, Careers  
Goodheart-Willcox.
- Harris, E. Introduction to Woodworking and Construction 1978  
(SI Metric) McGraw-Hill Ryerson.
- Wagner, Willis H. Modern Carpentry Goodheart-Willcox, 1979.
- Atkinson, H.F. Rough Carpentry and Masonry McGraw-Hill Ryerson, 1969.
- Cannon, K.F., Hatley, F.G. Building Construction Technology  
McGraw-Hill Ryerson, 1982.
- Smith, R.C. Principles and Practices of Light Construction  
Prentice Hall, 1980.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMST

GENERALIZATION: The development and demonstration of student knowledge in safe tool, equipment and material use is important in the industrial education program.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	<p>The student will:</p> <ul style="list-style-type: none"><li>- recognize unsafe acts and unsafe conditions</li><li>- identify and list factors affecting safety in the work environment such as:<ul style="list-style-type: none"><li>- location and use of fire extinguishers</li><li>- dress and clothing requirements</li><li>- safety guards and eye protection</li><li>- storage of materials and supplies</li><li>- student behavior</li></ul></li></ul>		
2. Safety Program	<ul style="list-style-type: none"><li>- participate in implementation of a safety program for the work environment</li></ul>		
3. Safe Work Habits and Tool Operations	<ul style="list-style-type: none"><li>- use tools and equipment in a safe manner</li></ul>		
4. Accident Reports	<ul style="list-style-type: none"><li>- identify the purpose of accident report forms and follow the correct procedure for reporting accidents</li></ul>		
5. Compensation	<ul style="list-style-type: none"><li>- explain the basic function of benefits under the Workers' Compensation Act</li></ul>		

NOTES:

TOPIC 2: SUB-TRADES

IEMST

GENERALIZATION: In the construction field many craftsman use their skills in sub-trade component tasks, which have to be organized sequentially, to produce the completed structure.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Tools:</p> <ul style="list-style-type: none"><li>- identification and use</li><li>- care and storage</li></ul> <p>2. Excavating:</p> <ul style="list-style-type: none"><li>- procedures</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- identify and correctly use the following types of tools in the sub-trades areas:<ul style="list-style-type: none"><li>- hand tools</li><li>- power tools</li><li>- measuring tools</li><li>- special tools</li></ul></li><li>- demonstrate the correct care, maintenance and storage of all tools</li><li>- describe the methods commonly used and, where possible, practise the following tasks:<ul style="list-style-type: none"><li>- layout site for building</li><li>- shoot levels and erect batter boards</li><li>- establish lot lines and square project</li><li>- determine equipment required for the construction of a building</li><li>- determine amount of backfill required</li></ul></li></ul>		

NOTES:

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>3. Cribbing:</p> <ul style="list-style-type: none"> <li>- basement forming</li> </ul>	<ul style="list-style-type: none"> <li>- describe the methods commonly used and, where possible, practise the following:               <ul style="list-style-type: none"> <li>- list the equipment needed to form a basement</li> <li>- prepare forms or molds</li> <li>- erect a section of basement form</li> <li>- square and plumb all corners</li> <li>- brace project adequately</li> <li>- install part of sub-floor</li> </ul> </li> </ul>		
<p>4. Concrete:</p> <ul style="list-style-type: none"> <li>- types of cement</li> <li>- preparation</li> <li>- use</li> </ul>	<ul style="list-style-type: none"> <li>- explain the composition of Portland cement</li> <li>- prepare a concrete mix with attention to:               <ul style="list-style-type: none"> <li>- aggregate</li> <li>- mixing ratio</li> </ul> </li> <li>- use concrete in a mold with attention to:               <ul style="list-style-type: none"> <li>- parting agents for molds</li> <li>- reinforcement</li> <li>- tamping</li> <li>- finishing</li> </ul> </li> </ul>		
<p>5. Framing:</p> <ul style="list-style-type: none"> <li>- terminology and interpretation</li> </ul>	<ul style="list-style-type: none"> <li>- be able to recognize on drawings and explain the use of:               <ul style="list-style-type: none"> <li>- studs</li> <li>- rafters</li> <li>- plates</li> <li>- cripples</li> <li>- trimmers</li> <li>- jacks</li> </ul> </li> </ul>		

NOTES:

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"> <li>- layout and application</li> </ul>	<ul style="list-style-type: none"> <li>- layout plates with doors or windows in walls</li> <li>- layout proper corners</li> <li>- nail frames together when possible</li> <li>- recognize the different material for sheathings and apply same when necessary</li> </ul>		
6. Scaffolding:			
<ul style="list-style-type: none"> <li>- parts</li> </ul>	<ul style="list-style-type: none"> <li>- name the main parts of scaffolding, such as: <ul style="list-style-type: none"> <li>- pins</li> <li>- ends</li> <li>- planks</li> <li>- outriggers</li> </ul> </li> </ul>		
<ul style="list-style-type: none"> <li>- application</li> </ul>	<ul style="list-style-type: none"> <li>- construct a section of scaffolding and explain the safety precautions which have to be considered when working with scaffolding</li> </ul>		
7. Flooring:			
<ul style="list-style-type: none"> <li>- types</li> </ul>	<ul style="list-style-type: none"> <li>- describe the types of materials and examine their function suitability and aesthetic qualities</li> </ul>		
<ul style="list-style-type: none"> <li>- applications</li> </ul>	<ul style="list-style-type: none"> <li>- apply a variety of flooring materials to a prepared base</li> </ul>		
8. Roofing:			
<ul style="list-style-type: none"> <li>- types</li> </ul>	<ul style="list-style-type: none"> <li>- describe the various types of roofs commonly used on buildings</li> </ul>		

NOTES:

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"> <li>- pitch</li> <li>- materials</li> <li>- application</li> </ul>	<ul style="list-style-type: none"> <li>- discuss pitch and explain the reasons for using different pitches</li> <li>- identify various roofing materials used with different roofs</li> <li>- determine roof measurements and the material required for a specific roof</li> <li>- install shingles to a prepared base</li> </ul>		
<p>9. Plumbing:</p> <ul style="list-style-type: none"> <li>- materials</li> <li>- jointing</li> <li>- procedures</li> </ul>	<ul style="list-style-type: none"> <li>- discuss plumbing blueprints and identify:               <ul style="list-style-type: none"> <li>- types of piping</li> <li>- fittings commonly used</li> </ul> </li> <li>- discuss the techniques used for joining pipes:               <ul style="list-style-type: none"> <li>- copper</li> <li>- plastic</li> </ul> </li> <li>- join up various copper pipe and fittings and connect to water supply</li> <li>- join up various pieces of plastic pipe and glue a joint as a demonstration</li> </ul>		
<p>10. Heating:</p> <ul style="list-style-type: none"> <li>- types</li> <li>- installation</li> </ul>	<ul style="list-style-type: none"> <li>- discuss the types of heating used in buildings, such as:               <ul style="list-style-type: none"> <li>- forced air</li> <li>- hot water</li> <li>- solar</li> </ul> </li> <li>- connect various fittings and components on a prepared form</li> </ul>		

NOTES:

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>11. Electrical:</p> <ul style="list-style-type: none"> <li>- theory</li> <li>- circuitry</li> <li>- installation</li> </ul>	<ul style="list-style-type: none"> <li>- explain basic electrical theory</li> <li>- list the materials required and the method used in constructing a typical circuit containing: <ul style="list-style-type: none"> <li>- lights</li> <li>- switches</li> <li>- outlets</li> </ul> </li> <li>- list accessories used in wiring a typical room</li> <li>- make the necessary wiring connections on a prepared frame</li> </ul>		
<p>12. Insulation:</p> <ul style="list-style-type: none"> <li>- materials</li> <li>- installation</li> </ul>	<ul style="list-style-type: none"> <li>- explain why insulation is necessary in buildings and list some of the materials commonly used for insulation purposes</li> <li>- explain what is meant by R factor</li> <li>- explain why vapour barriers are used in buildings</li> <li>- install vapour barrier and insulation in a prepared wall</li> </ul>		
<p>13. Drywall:</p> <ul style="list-style-type: none"> <li>- advantages</li> </ul>	<ul style="list-style-type: none"> <li>- list some of the advantages of using drywall, such as: <ul style="list-style-type: none"> <li>- fireproofing</li> <li>- soundproofing</li> <li>- insulating</li> <li>- durability</li> <li>- takes paint well</li> <li>- reasonably cheap</li> </ul> </li> </ul>		

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- installation	- apply drywall to a pre-framed wall with attention to: - thickness of drywall - cutting and trimming - dual nailing and screws		
- taping joints	- tape and finish the drywall application complete with outside metal corners		
- finishing materials	- list the materials commonly used to finish walls, such as: - paints - varnishes - oils - wall paper		
- application	- use the correct procedures to apply a variety of finishes to a prepared wall		
14. Bricklaying:			
- materials	- explain how some of the commonly used bricks and blocks are made with attention to: - materials - conditioning		
- mortar	- explain how mortar is mixed and how it cures		
- building procedures	- use bricks in the construction of a wall with attention to: - mortar application - placing bricks - building techniques - control joints - finishing joints		

NOTES:

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>15. Tile:</p> <ul style="list-style-type: none"> <li>- types</li> <li>- bonding</li> <li>- installation</li> </ul>	<ul style="list-style-type: none"> <li>- identify several different types of tile, such as: <ul style="list-style-type: none"> <li>- ceramic mosaic</li> <li>- glazed interior</li> <li>- quarry</li> </ul> </li> <li>- explain where each type of tile is used such as: <ul style="list-style-type: none"> <li>- heavy traffic (commercial)</li> <li>- wet areas (floors, walls)</li> </ul> </li> <li>- describe the types of bonding agents used for several types of tiles, such as: <ul style="list-style-type: none"> <li>- cement mortar</li> <li>- organic adhesives</li> <li>- inorganic bonding</li> </ul> </li> <li>- use tile on a prepared base with attention to: <ul style="list-style-type: none"> <li>- shapes, size and colour of tiles</li> <li>- glueing</li> <li>- straightening and aligning</li> <li>- grouting</li> </ul> </li> </ul>		
<p>16. Glass:</p> <ul style="list-style-type: none"> <li>- ingredients</li> <li>- installation</li> </ul>	<ul style="list-style-type: none"> <li>- list the ingredients used in glass and explain the process used to make several types of glass</li> <li>- cut a pane of glass to size and install in a window with attention to: <ul style="list-style-type: none"> <li>- cutting tools</li> <li>- caulking material</li> <li>- finishing</li> </ul> </li> </ul>		

NOTES:

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>17. Siding:</p> <ul style="list-style-type: none"> <li>- types</li> <li>- installation</li> <li>- finish</li> </ul>	<ul style="list-style-type: none"> <li>- list a selection of materials used for the outside decoration of buildings, such as: <ul style="list-style-type: none"> <li>- wood siding</li> <li>- metal siding</li> <li>- plywood exterior finish</li> <li>- insulating fibre board siding</li> <li>- wood shingles and shakes</li> </ul> </li> <li>- install siding to a framed wall section with attention to: <ul style="list-style-type: none"> <li>- fasteners</li> <li>- correct corners</li> <li>- flashing</li> </ul> </li> <li>- apply an appropriate finish to a siding installation, if required</li> </ul>		
<p>18. Stucco:</p> <ul style="list-style-type: none"> <li>- materials</li> <li>- application</li> </ul>	<ul style="list-style-type: none"> <li>- list the materials used in stucco</li> <li>- apply stucco to a prepared wall with attention to: <ul style="list-style-type: none"> <li>- paper application</li> <li>- wire application</li> <li>- scratch coat</li> <li>- finish coat</li> <li>- types of finishes</li> </ul> </li> </ul>		
<p>19. Cabinet Installation</p>	<ul style="list-style-type: none"> <li>- learn how to layout a floor plan to scale for a cabinet installation</li> <li>- perform a cabinet installation if facilities available</li> </ul>		

NOTES:

TOPIC 2: SUB-TRADES (continued)

IEMST

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
20. Suspended Ceilings	<ul style="list-style-type: none"><li>- discuss the following as they apply to cabinets:<ul style="list-style-type: none"><li>- sections and units of installations</li><li>- fitting and fastening</li><li>- finishing techniques</li></ul></li><li>- describe the application procedure for laminating a counter top</li><li>- describe the material used and installation techniques for suspended ceilings</li><li>- perform an installation of components if facility available</li></ul>		

NOTES:

MODULE FOUR  
CABINET CONSTRUCTION (BASIC)

Introduction

This module is designed to acquaint students with a variety of materials and methods which may be used to introduce cabinet construction procedures and projects.

Objectives

The objectives of the Cabinet Construction (Basic) module are to:

1. Develop an awareness of material production and selection from available natural sources.
2. Provide the student with the opportunity to apply skills developed in design and the use of tools and machines to basic cabinet construction.
3. Provide an insight into the fabrication and manufacture of practical wood products.

Learning Resources

\*Feirer, J.L. Cabinet Making and Millwork, Chas. A. Bennett.

Miller, H.G. Hand and Machine Woodwork (Metric Edition)  
Gage Publishing, 1980.

Wagner, Willis H., Modern Woodworking Goodheart-Willcox, 1978.

Feirer, J.L. Woodworking for Industry Chas. A. Bennett, 1978.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMCC

GENERALIZATION: The development and demonstration of student knowledge in safe tool, equipment and material use is important in the industrial education program.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	<p>The student will:</p> <ul style="list-style-type: none"><li>- recognize unsafe acts and unsafe conditions</li><li>- identify and list factors affecting safety in the work environment such as:<ul style="list-style-type: none"><li>- location and use of fire extinguishers</li><li>- dress and clothing requirements</li><li>- safety guards and eye protection</li><li>- storage of materials and supplies</li><li>- student behavior</li></ul></li></ul>		
2. Safety Program	<ul style="list-style-type: none"><li>- participate in implementation of a safety program for the work environment</li></ul>		
3. Safe Work Habits and Tool Operations	<ul style="list-style-type: none"><li>- use tools and equipment in a safe manner</li></ul>		
4. Accident Reports	<ul style="list-style-type: none"><li>- identify the purpose of accident report forms and follow the correct procedure for reporting accidents</li></ul>		
5. Compensation	<ul style="list-style-type: none"><li>- explain the basic function of benefits under the Workers' Compensation Act</li></ul>		

NOTES:

TOPIC 2: IDENTIFYING AND SELECTING MATERIALS

IEMCC

GENERALIZATION: Raw materials must be processed into a variety of products for use in cabinetry.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Sources	The student will: <ul style="list-style-type: none"><li>- identify the sources of wood materials used in cabinet construction:</li><li>- dimension lumber</li><li>- plywoods and veneers</li><li>- by-product materials</li></ul>		
2. Identification and Properties	<ul style="list-style-type: none"><li>- identify hardwoods and softwoods and their suitability for various types of applications, according to:</li><li>- strength</li><li>- hardness</li><li>- density</li><li>- grain porosity</li></ul>		
3. Selection	<ul style="list-style-type: none"><li>- identify adaptability of materials to cabinet products with regards to:</li><li>- durability</li><li>- grain patterns</li><li>- cellular structures</li><li>- weight, density, color</li><li>- finishing qualities</li></ul>		

NOTES:

TOPIC 3: PROJECT DEVELOPMENT

IEMCC

GENERALIZATION: Projects must be systematically planned and developed to produce desirable products.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Planning	The student will: <ul style="list-style-type: none"><li>- coordinate the elements of line, form, shape, movement and serviceability into project development</li></ul>		
2. Design	<ul style="list-style-type: none"><li>- incorporate design techniques into working drawings</li><li>- develop plans from which the cabinet project will be completed</li></ul>		
3. Implementation	<ul style="list-style-type: none"><li>- interpret various forms of graphic illustrations, such as:<ul style="list-style-type: none"><li>- working drawings</li><li>- schematics</li><li>- pictorial drawings</li><li>- patterns</li></ul>and transfer their features to the materials and products being utilized</li></ul>		

NOTES:

TOPIC 4: MEASUREMENT AND LAYOUT

IEMCC

GENERALIZATION: Appropriate tool and machine processes are required to develop useable forms from materials and accessories.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Shaping	<p>The student will:</p> <ul style="list-style-type: none"><li>- correctly employ appropriate tools and machines for material removal:<ul style="list-style-type: none"><li>- planes and planing machines</li><li>- hand and power saws</li><li>- files and sanders</li><li>- hand and power drills</li><li>- routers and shapers</li><li>- chisels and lathes</li></ul></li></ul>		
2. Forming	<ul style="list-style-type: none"><li>- utilize various forms of abrasion, bending, combining and laminating</li></ul>		
3. Combining: <ul style="list-style-type: none"><li>- fasteners</li></ul>	<ul style="list-style-type: none"><li>- use mechanical fastening devices, such as:<ul style="list-style-type: none"><li>- nails</li><li>- staples</li><li>- screws</li><li>- bolts</li><li>- hinges</li><li>- catches</li><li>- corrugated fasteners</li><li>- clamps</li></ul></li></ul>		
<ul style="list-style-type: none"><li>- jointing</li></ul>	<ul style="list-style-type: none"><li>- apply various wood joints to cabinetry where appropriate:<ul style="list-style-type: none"><li>- butt</li><li>- dado</li><li>- rabbet</li><li>- mitre</li><li>- lap</li><li>- mortise and tenon</li></ul></li></ul>		

NOTES:

TOPIC 4: MEASUREMENT AND LAYOUT (continued)

IEMCC

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- adhesion	<ul style="list-style-type: none"><li>- utilize various bonding materials in construction of projects:</li><li>- glues</li><li>- contact cements</li><li>- adhesives</li><li>- resins</li></ul>		

TOPIC 5: FINISHING

IEMCC

GENERALIZATION: Appropriate finishing products are utilized to enhance appearances as well as protect wood surfaces.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Preparation	<p>The student will:</p> <ul style="list-style-type: none"><li>- utilize appropriate tools and materials to prepare wood surfaces for finish materials:</li><li>- sanding</li><li>- scraping</li><li>- rubbing</li></ul>		
2. Fillers	<ul style="list-style-type: none"><li>- apply paste and liquid wood fillers when appropriate</li></ul>		
3. Stains	<ul style="list-style-type: none"><li>- employ accepted procedures to apply wood stains in varied forms</li></ul>		
4. Finishes	<ul style="list-style-type: none"><li>- complete projects through the application of final finish materials such as:</li><li>- varnishes</li><li>- waxes</li><li>- shellac</li><li>- oils</li><li>- lacquers</li><li>- enamels</li><li>- paints</li></ul>		

MODULE FIVE  
CABINET CONSTRUCTION (ADVANCED)

Introduction

In this module students are afforded an opportunity to extend their background in cabinet making skills and techniques when constructing a piece of furniture.

Objectives

The objectives of the Cabinet Construction (Advanced) module are to:

1. Give the student an opportunity to develop an appreciation for furniture design and the materials used in its construction.
2. Provide the student with a base from which to apply and practise quality cabinet construction procedures and techniques.
3. Give the student an opportunity to select finishing materials and techniques and develop skill in their application.

Learning Resources

\*Feirer, J.L. Cabinet Making and Millwork, Chas. A. Bennett Co.

Groneman and Glazener, Technical Woodworking (2nd Edition)  
McGraw-Hill Ryerson, 1976.

Wagner, Willis H., Modern Woodworking Goodheart-Willcox, 1978.

Feirer and Hutchings Advanced Woodwork and Furniture Making  
Chas. A. Bennett Co. 4th Edition.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMCA

GENERALIZATION: The development and demonstration of student knowledge in safe tool, equipment and material use is important in the industrial education program.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	<p>The student will:</p> <ul style="list-style-type: none"><li>- recognize unsafe acts and unsafe conditions</li><li>- identify and list factors affecting safety in the work environment such as:<ul style="list-style-type: none"><li>- location and use of fire extinguishers</li><li>- dress and clothing requirements</li><li>- safety guards and eye protection</li><li>- storage of materials and supplies</li><li>- student behavior</li></ul></li></ul>		
2. Safety Program	<ul style="list-style-type: none"><li>- participate in implementation of a safety program for the work environment</li></ul>		
3. Safe Work Habits and Tool Operations	<ul style="list-style-type: none"><li>- use tools and equipment in a safe manner</li></ul>		
4. Accident Reports	<ul style="list-style-type: none"><li>- identify the purpose of accident report forms and follow the correct procedure for reporting accidents</li></ul>		
5. Compensation	<ul style="list-style-type: none"><li>- explain the basic function of benefits under the Workers' Compensation Act</li></ul>		

NOTES:

TOPIC 2: IDENTIFYING AND SELECTING MATERIALS

IEMCA

GENERALIZATION: Raw materials must be processed into a variety of products for use in cabinetry.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Sources	The student will: <ul style="list-style-type: none"><li>- identify the sources of wood materials used in cabinet construction:<ul style="list-style-type: none"><li>- dimension lumber</li><li>- plywoods and veneers</li><li>- by-product materials</li></ul></li></ul>		
2. Identification and Properties	<ul style="list-style-type: none"><li>- identify hardwoods and softwoods and their suitability for various types of applications, according to:<ul style="list-style-type: none"><li>- strength</li><li>- hardness</li><li>- density</li><li>- grain porosity</li></ul></li></ul>		
3. Selection	<ul style="list-style-type: none"><li>- identify adaptability of materials to cabinet products with regards to:<ul style="list-style-type: none"><li>- durability</li><li>- grain patterns</li><li>- cellular structures</li><li>- weight, density, color</li><li>- finishing qualities</li></ul></li></ul>		

NOTES:

TOPIC 3: PROJECT DEVELOPMENT

IEMCA

GENERALIZATION: Desirable furniture products are the result of systematically researched and developed ideas.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Planning	The student will: <ul style="list-style-type: none"><li>- coordinate the elements of line, form, shape, movement and serviceability and aesthetic appeal into project development</li></ul>		
2. Design	<ul style="list-style-type: none"><li>- discuss concepts of door and drawer design where applicable</li><li>- expand design techniques into working drawings</li><li>- complete detailed plans of project and procedures to be implemented</li></ul>		
3. Implementation	<ul style="list-style-type: none"><li>- transfer and coordinate aspects of plans and design to materials utilized in construction of project</li></ul>		

NOTES:

TOPIC 4: MEASUREMENT AND LAYOUT

IEMCA

GENERALIZATION: A quality product and the conservation of materials depends upon accuracy.

CONCEPTS/SURCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Measurement	<p>The student will:</p> <ul style="list-style-type: none"><li>- employ appropriate techniques and skill in the use of measuring tools and instruments, such as:<ul style="list-style-type: none"><li>- tapes</li><li>- ruler</li><li>- squares</li><li>- T-bevels</li><li>- dividers</li><li>- trammel points</li><li>- marking gauges</li></ul></li></ul>		
2. Layout	<ul style="list-style-type: none"><li>- utilize techniques developed to transfer concepts from graphic illustration to project materials with the use of appropriate tools and instruments</li></ul>		

NOTES:

TOPIC 5: SHAPING, FORMING AND FASTENING

IEMCA

GENERALIZATION: Appropriate tool and machine processes are required to develop useable forms from materials and accessories.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Shaping	The student will: <ul style="list-style-type: none"><li>- correctly employ appropriate tools and machines for material removal:<ul style="list-style-type: none"><li>- planes and planing machines</li><li>- hand and power saws</li><li>- files and sanders</li><li>- hand and power drills</li><li>- routers and shapers</li><li>- chisels and lathes</li></ul></li></ul>		
2. Forming	<ul style="list-style-type: none"><li>- utilize various forms of abrasion, bending, combining, laminating, and inlaying</li></ul>		
3. Combining: <ul style="list-style-type: none"><li>- fasteners</li></ul>	<ul style="list-style-type: none"><li>- employ mechanical fastening devices, such as:<ul style="list-style-type: none"><li>- nails</li><li>- staples</li><li>- screws</li><li>- bolts</li><li>- hinges</li><li>- catches</li><li>- corrugated fasteners</li><li>- clamps</li></ul></li></ul>		
4. Fabrication	<ul style="list-style-type: none"><li>- apply appropriate production methods to meet acceptable tolerances in all products</li></ul>		

NOTES:

TOPIC 5: SHAPING, FORMING AND FASTENING (continued)

IEMCA

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- jointing	- apply various wood joints to cabinetry where appropriate: <ul style="list-style-type: none"><li>- butt</li><li>- dado</li><li>- rabbet</li><li>- mitre</li><li>- lap</li><li>- mortise and tenon</li></ul>		
- adhesion	- utilize various bonding materials in construction of projects <ul style="list-style-type: none"><li>- glue</li><li>- contact cements</li><li>- adhesives</li><li>- resins</li></ul>		

TOPIC 6: FINISHING

IEMCA

GENERALIZATION: Appropriate finishing products are utilized to enhance appearances as well as protect wood surfaces.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Preparation	The student will: <ul style="list-style-type: none"><li>- utilize appropriate tools and materials to prepare wood surfaces for finish materials:<ul style="list-style-type: none"><li>- sanding</li><li>- scraping</li><li>- rubbing</li></ul></li></ul>		
2. Fillers	<ul style="list-style-type: none"><li>- apply paste and liquid wood fillers when appropriate</li></ul>		

NOTES:

TOPIC 6: FINISHING (continued)

IEMCA

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
3. Stains	- employ accepted procedures to apply wood stains in varied forms		
4. Finishes	- complete projects through the application of final finish materials, such as: <ul style="list-style-type: none"><li>- varnishes</li><li>- waxes</li><li>- shellac</li><li>- oils</li><li>- lacquers</li><li>- enamels</li><li>- paints</li></ul>		

NOTES:

MODULE SIX  
GENERAL METALS

Introduction

Metals play a major role in our productive society since many products of today's technology are dependent on components made of metal.

General Metals is a study of various aspects of metalworking.

Objectives

The objectives of the General Metals module are to:

1. Introduce the student to generalizations and concepts that are common to industry and apply them to metals.
2. Provide the student with an opportunity to explore processes employed in the metals industry.
3. Develop in the student an awareness of the major occupations in the related career fields.

Learning Resources

Budzik, R. Sheet Metal Technology 2nd Ed. Bobbs-Merrill Co. Inc.

\*Feirer, John L. General Metals, 3rd Ed., McGraw-Hill Ryerson, 1976.

Krar, S.F., St. Amand, J.E., Machine Shop Training, 3rd Ed.  
McGraw-Hill Ryerson, 1977.

Neundorf, Bill, Stevens, Claude, Sheet Metal Practice,  
McGraw-Hill Ryerson, 1977.

Walker, John R., Modern Metalworking, Goodheart-Willcox, 1973.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMGM

GENERALIZATION: Students should develop attitudes of safety and observe safe procedures when working with tools, machines and equipment in the laboratory.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>The student will:</p> <p>1. Unsafe Acts and Unsafe Conditions</p> <p>2. Accident Reports</p> <p>3. Compensation</p> <p>4. Safety Program</p>	<p>- identify and list acts and conditions which could cause injury in relation to tools and equipment, such as:</p> <ul style="list-style-type: none"> <li>- hand tools</li> <li>- power</li> <li>- hot metals</li> <li>- soldering</li> <li>- others</li> </ul> <p>- explain purpose and use of accident report forms and report all accidents</p> <p>- explain the function of and benefits available under the Workers' Compensation Act</p> <p>- participate in the prescribed safety program of the lab and/or school system</p> <p>- use appropriate safety apparel at all times</p>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS

IEMGM

GENERALIZATION: Raw materials must be processed, conditioned, and shaped before they are utilized in the manufacture of components for products.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources:</p> <ul style="list-style-type: none"><li>- location</li><li>- extraction</li></ul> <p>2. Processing:</p> <ul style="list-style-type: none"><li>- refining/ converting</li><li>- alloying</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- list the raw materials for some of the commonly used metals and identify several areas in Canada where they are located</li><li>- explain briefly how the main raw materials are extracted by surface or underground mining</li><li>- describe how iron and alumina are produced</li><li>- identify and describe the three steel making processes:<ul style="list-style-type: none"><li>- basic oxygen</li><li>- open hearth</li><li>- electric</li></ul></li><li>- explain the aluminum smelting process</li><li>- identify the elements commonly alloyed with steel and aluminum</li><li>- discuss the characteristics the alloying elements imparts to steel and aluminum:<ul style="list-style-type: none"><li>- toughness</li><li>- hardness</li><li>- strength</li><li>- wear resistance</li></ul></li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS  
(continued)

IEMGM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>3. Identification:</p> <ul style="list-style-type: none"> <li>- properties</li> <li>- testing</li> <li>- shapes and sizes</li> </ul>	<ul style="list-style-type: none"> <li>- list the basic properties of ferrous and non-ferrous metals, such as: <ul style="list-style-type: none"> <li>- steel</li> <li>- copper</li> <li>- brass</li> <li>- aluminum</li> </ul> </li> <li>- identify the basic uses, similarities and differences between: <ul style="list-style-type: none"> <li>- sheet metal</li> <li>- bench metal</li> <li>- machine metal</li> <li>- art metal</li> </ul> </li> <li>- perform simple tests to identify several ferrous and non-ferrous metals, such as: <ul style="list-style-type: none"> <li>- spark</li> <li>- hardness</li> </ul> </li> <li>- explain the meaning of the following terms as they apply to metals: <ul style="list-style-type: none"> <li>- hardness</li> <li>- ductility</li> <li>- tensile</li> <li>- strength</li> <li>- carbon content</li> </ul> </li> <li>- identify several common shapes and sizes in which metals are available: <ul style="list-style-type: none"> <li>- sheet</li> <li>- plate</li> <li>- band</li> <li>- rod</li> <li>- square</li> <li>- flats</li> <li>- hexagonal</li> <li>- octagonal</li> <li>- angle</li> <li>- channel</li> <li>- I-beam</li> </ul> </li> </ul>		

## TOPIC 3: PRODUCT PLANNING AND DESIGN

IEMGM

GENERALIZATION: Product planning and design is an integral part of the production process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Planning:</p> <ul style="list-style-type: none"> <li>- design</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- discuss and list elements of design, such as:               <ul style="list-style-type: none"> <li>- line</li> <li>- color</li> <li>- form</li> <li>- material</li> <li>- movement</li> </ul> </li> <li>- discuss and list principles of design, such as:               <ul style="list-style-type: none"> <li>- balance</li> <li>- harmony</li> <li>- scale</li> <li>- practicality</li> </ul> </li> <li>- read and interpret technical drawings</li> <li>- use technical drawings for products being fabricated</li> <li>- produce patterns for sheet metal products</li> </ul>		
<ul style="list-style-type: none"> <li>- measurement</li> </ul>	<ul style="list-style-type: none"> <li>- use SI metric system in product planning and development</li> </ul>		

NOTES:

TOPIC 3: PRODUCT PLANNING AND DESIGN (continued)

IEMGM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- layout	<ul style="list-style-type: none"> <li>- use the following layout and measuring tools in product development:                             <ul style="list-style-type: none"> <li>- rules</li> <li>- square</li> <li>- scribe</li> <li>- dividers</li> <li>- prick punch</li> <li>- centre punch</li> <li>- calipers</li> <li>- micrometer or vernier caliper</li> <li>- surface gauge</li> </ul> </li> <li>- use layout dye</li> </ul>		

TOPIC 4: METAL SHAPING PROCESSES

IEMGM

GENERALIZATION: Metal stock can be shaped into useful products by removing, combining and forming processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Separation: - chip removal	The student will: <ul style="list-style-type: none"> <li>- use the following chip removal tools in product development:               <ul style="list-style-type: none"> <li>- hacksaw</li> <li>- power hacksaw</li> <li>- bandsaw</li> <li>- hand drill</li> <li>- drill press</li> <li>- grinder</li> <li>- punches</li> <li>- files</li> <li>- reamers</li> <li>- taps and dies</li> <li>- engine lathe</li> <li>- milling machine</li> <li>- shaper</li> </ul> </li> </ul>		

TOPIC 4: METAL SHAPING PROCESSES (continued)

IEMGM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"> <li>- non-chip removal</li> </ul>	<ul style="list-style-type: none"> <li>- use the following non-chip removal tools and equipment in product development: <ul style="list-style-type: none"> <li>- chisels</li> <li>- snips</li> <li>- squaring shears</li> <li>- notcher</li> </ul> </li> </ul>		
<p>2. Forming:</p> <ul style="list-style-type: none"> <li>- bending</li> </ul>	<ul style="list-style-type: none"> <li>- use the following bending tools and equipment in product development: <ul style="list-style-type: none"> <li>- anvil</li> <li>- stakes</li> <li>- mallets</li> <li>- hammers</li> <li>- bender</li> <li>- rivet sets</li> <li>- pliers</li> <li>- clamping devices</li> <li>- box and pan brake</li> <li>- seamer</li> <li>- groover</li> <li>- bar folder</li> </ul> </li> </ul>		
<ul style="list-style-type: none"> <li>- rolling</li> </ul>	<ul style="list-style-type: none"> <li>- use the following turning tools and equipment in product development: <ul style="list-style-type: none"> <li>- slip roll former</li> <li>- crimping and beading machine</li> <li>- rotary machine</li> </ul> </li> </ul>		
<ul style="list-style-type: none"> <li>- forging</li> </ul>	<ul style="list-style-type: none"> <li>- use the following forging tools and equipment to produce a product: <ul style="list-style-type: none"> <li>- forge</li> <li>- anvil</li> <li>- tongs</li> <li>- ball peen and cross peen hammers</li> <li>- hardies</li> <li>- swages</li> <li>- forging chisels and punches</li> </ul> </li> </ul>		

NOTES:

TOPIC 4: METAL SHAPING PROCESSES (continued)

IEMGM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>3. Conditioning:</p> <ul style="list-style-type: none"> <li>- heat</li> </ul>	<ul style="list-style-type: none"> <li>- discuss and use the following processes in product development: <ul style="list-style-type: none"> <li>- hardening</li> <li>- tempering</li> <li>- annealing</li> </ul> </li> </ul>		
<p>4. Combining:</p> <ul style="list-style-type: none"> <li>- fasteners</li> </ul>	<ul style="list-style-type: none"> <li>- discuss and use the following in product development: <ul style="list-style-type: none"> <li>- rivets</li> <li>- screws</li> <li>- bolts</li> <li>- pop-rivets</li> </ul> </li> </ul>		
<ul style="list-style-type: none"> <li>- adhesion</li> </ul>	<ul style="list-style-type: none"> <li>- discuss the use of chemical welding and use adhesives to join metals</li> <li>- discuss the use of fluxes when soldering different metals</li> <li>- discuss and use the following devices to solder different joints: <ul style="list-style-type: none"> <li>- soldering copper; electric</li> <li>- soldering copper; gas torch</li> </ul> </li> </ul>		
<ul style="list-style-type: none"> <li>- cohesion</li> </ul>	<ul style="list-style-type: none"> <li>- discuss resistance welding and determine the limitations</li> <li>- use spot welding equipment to weld metal components in product development</li> </ul>		

NOTES:

## MODULE SEVEN

### SHEET METAL

#### Introduction

Metals play a major role in our productive society since many products of today's technology are dependent on components made of metal.

Sheet Metal is a major area of the metals industry.

#### Objectives

The objectives of the Sheet Metal module are to:

1. Introduce the student to generalizations and concepts that are common to industry and apply them to sheet metals.
2. Provide the student with an opportunity to explore processes employed in the metals industry.
3. Develop in the student an awareness of the major occupations in the related career fields.

#### Learning Resources

- \*Zinngarbe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, Delmar Publishers, 1974.
- \*Zinngarbe, Claude J., Schumacher, Fred W., Sheet Metal Machine Processes, Delmar Publishers, 1975.
- Budzik, R. Sheet Metal Technology 2nd Ed. Robbs-Merrill Co. Inc.
- Feirer, John L. General Metals, McGraw-Hill Ryerson, 1976.
- Neundorf, Bill, Stevens, Claude, Sheet Metal Practice, McGraw-Hill Ryerson, 1977.
- Walker, John R., Modern Metalworking, Goodheart-Willcox, 1973.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMSM

GENERALIZATION: Students should develop attitudes of safety and observe safe procedures when working with tools, machines and equipment in the laboratory.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	The student will: <ul style="list-style-type: none"><li>- identify and list acts and conditions which could cause injury in relation to tools and equipment, such as:<ul style="list-style-type: none"><li>- hand tools</li><li>- power</li><li>- hot metals</li><li>- soldering</li><li>- others</li></ul></li></ul>		
2. Accident Reports	<ul style="list-style-type: none"><li>- explain purpose and use of accident reports forms and report all accidents</li></ul>		
3. Compensation	<ul style="list-style-type: none"><li>- explain the function of and benefits available under the Workers' Compensation Act</li></ul>		
4. Safety Program	<ul style="list-style-type: none"><li>- participate in the prescribed safety program of the lab and/or school system</li><li>- use appropriate safety apparel at all times</li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS

IEMSM

GENERALIZATION: Raw materials must be extracted and processed in order to produce materials of standard size and quality which can be used for manufacturing useful products and components.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources:</p> <ul style="list-style-type: none"> <li>- location</li> <li>- extraction</li> </ul> <p>2. Processing:</p> <ul style="list-style-type: none"> <li>- refining/ converting</li> <li>- alloying</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- discuss the locations of iron ore and bauxite, how they are transported and locations of processing plants</li> <li>- discuss how the main raw materials are extracted by the open-pit or underground method</li> <li>- describe how iron and alumina are produced</li> <li>- explain the three steel making processes: <ul style="list-style-type: none"> <li>- basic oxygen</li> <li>- open hearth</li> <li>- electric</li> </ul> </li> <li>- identify the elements commonly alloyed with steel and aluminum</li> <li>- discuss the characteristics the alloying elements imparts to steel and aluminum: <ul style="list-style-type: none"> <li>- toughness</li> <li>- hardness</li> <li>- strength</li> <li>- wear resistance</li> </ul> </li> </ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS  
(continued)

IEMSM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>3. Identification:</p> <ul style="list-style-type: none"><li>- properties</li><li>- testing</li><li>- standard shapes and sizes</li></ul>	<ul style="list-style-type: none"><li>- discuss the basic properties of common ferrous and non-ferrous metals</li><li>- perform simple test on ferrous and non-ferrous metals for identification, such as:<ul style="list-style-type: none"><li>- spark</li><li>- hardness</li><li>- flexibility</li><li>- tensile</li></ul></li><li>- identify the various shapes and sizes in which ferrous and non-ferrous metals are available, such as:<ul style="list-style-type: none"><li>- sheet</li><li>- plate</li><li>- band</li><li>- rod</li><li>- square</li><li>- flats</li><li>- hexagonal</li><li>- octagonal</li><li>- angle</li><li>- channel</li><li>- I-beam</li></ul></li></ul>		

NOTES:

TOPIC 3: PRODUCT PLANNING AND DESIGN

IEMSM

GENERALIZATION: Product planning and design is an integral part of the production process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Planning:</p> <ul style="list-style-type: none"> <li>- design</li> <li>- measurement</li> <li>- layout</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- discuss and list elements of design, such as: <ul style="list-style-type: none"> <li>- line</li> <li>- color</li> <li>- form</li> <li>- material</li> <li>- movement</li> </ul> </li> <li>- discuss and list principles of design, such as: <ul style="list-style-type: none"> <li>- balance</li> <li>- harmony</li> <li>- scale</li> <li>- practicality</li> </ul> </li> <li>- read and interpret technical drawings</li> <li>- use technical drawings for products being fabricated</li> <li>- produce pattern for sheet metal products</li> <li>- use SI Metric System in product planning and development</li> <li>- use the following layout and measuring tools in product development: <ul style="list-style-type: none"> <li>- rules</li> <li>- square</li> <li>- scribe</li> <li>- divider</li> </ul> </li> </ul>		

NOTES:

TOPIC 3: PRODUCT PLANNING AND DESIGN (continued)

IEMSM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	<ul style="list-style-type: none"> <li>- prick punch</li> <li>- centre punch</li> <li>- calipers</li> <li>- micrometer or vernier caliper</li> <li>- surface gauge</li> <li>- protractor</li> <li>- use layout dye</li> <li>- layout the following patterns:               <ul style="list-style-type: none"> <li>- straightline</li> <li>- cylindrical</li> <li>- conical</li> </ul> </li> </ul>		

TOPIC 4: SHAPING PROCESSES

IEMSM

GENERALIZATION: Sheet metal stock can be shaped into useful products by removing, combining and forming processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Separation:</p> <ul style="list-style-type: none"> <li>- chip removal</li> <li>- non-chip removal</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- use the following tools safely:               <ul style="list-style-type: none"> <li>- hacksaw</li> <li>- hand drill</li> <li>- drill press</li> <li>- punches</li> </ul> </li> <li>- use the following tools safely:               <ul style="list-style-type: none"> <li>- snips</li> <li>- squaring shears</li> <li>- notcher</li> <li>- chisels</li> </ul> </li> </ul>		

TOPIC 4: SHAPING PROCESSES (continued)

IEMSM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>2. Forming:</p> <ul style="list-style-type: none"> <li>- bending</li> <li>- rolling</li> </ul> <p>3. Combining:</p> <ul style="list-style-type: none"> <li>- Mechanical</li> <li>- adhesion</li> </ul>	<ul style="list-style-type: none"> <li>- use the following tools and machines safely: <ul style="list-style-type: none"> <li>- stakes</li> <li>- mallets</li> <li>- hammers</li> <li>- seamer</li> <li>- groover</li> <li>- bar folder</li> <li>- box and pan brake</li> </ul> </li> <li>- use the following machines: <ul style="list-style-type: none"> <li>- slip roll former</li> <li>- crimping and beading machine</li> <li>- rotary machine</li> </ul> </li> <li>- make the following hems <ul style="list-style-type: none"> <li>- single</li> <li>- double</li> </ul> </li> <li>- make the following seams: <ul style="list-style-type: none"> <li>- grooved</li> <li>- double</li> <li>- inside/outside lap</li> <li>- locked corner</li> <li>- cap strip</li> </ul> </li> <li>- wire an edge</li> <li>- discuss the use of chemical welding and use adhesives to join metals</li> <li>- discuss the purpose and use of fluxes when soldering sheet metal</li> </ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEMSM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"><li>- cohesion</li><li>- fasteners</li></ul>	<ul style="list-style-type: none"><li>- use the following devices to solder different joints:<ul style="list-style-type: none"><li>- soldering copper; electric</li><li>- soldering copper; gas torch</li></ul></li><li>- discuss resistance welding and determine the limitations</li><li>- use spot welding equipment to weld seams</li><li>- combine sheet metal using:<ul style="list-style-type: none"><li>- rivets</li><li>- pop rivets</li><li>- sheet metal screws</li></ul></li></ul>		

NOTES:

MODULE EIGHT  
MACHINE METAL

Introduction

Metals play a major role in our productive society since many products of today's technology are dependent on components made of metal.

Machine Metal is a major area of the metals industry.

Objectives

The objectives of the Machine Metal module are to:

1. Introduce the student to generalizations and concepts that are common to industry and apply them to machine metals.
2. Provide the student with an opportunity to explore processes employed in the metals industry.
3. Develop in the student an awareness of the major occupations in the related career fields.

Learning Resources

\*Krar, S.F., Oswald, St. Amand J.E., Machine Shop Training, 3rd Edition, McGraw-Hill Ryerson, 1977 c/w Machine Shop Operations - Visutext.

Feirer, John L. General Metals, 3rd Edition, McGraw-Hill Ryerson, 1976.

Feirer, John L., Tatro, Earl E., Machine Tool Metalworking, McGraw-Hill Ryerson, 1973.

Walker, John R., Machining Fundamentals, Goodheart-Willcox, 1977.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMMM

GENERALIZATION: Students should develop attitudes of safety and observe safe procedures when working with tools, machines and equipment in the laboratory.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Unsafe Acts and Unsafe Conditions</p> <p>2. Accident Reports</p> <p>3. Compensation</p> <p>4. Safety Program</p>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- identify and list acts and conditions which could cause injury in relation to tools and equipment, such as: <ul style="list-style-type: none"> <li>- hand tools</li> <li>- power</li> <li>- hot metals</li> <li>- soldering</li> <li>- others</li> </ul> </li> <li>- explain purpose and use of accident report forms and report all accidents</li> <li>- explain the function and benefits available under the Workers' Compensation Act</li> <li>- participate in the prescribed safety program of the lab and/or school system</li> <li>- use appropriate safety apparel at all times</li> </ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS

IEMMM

GENERALIZATION: Raw materials must be extracted and processed in order to produce materials of standard size and quality which can be used for manufacturing useful products and components.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources:</p> <ul style="list-style-type: none"> <li>- location</li> <li>- extraction</li> </ul> <p>2. Processing:</p> <ul style="list-style-type: none"> <li>- refining/ converting</li> <li>- alloying</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- discuss the locations of iron ore and bauxite, how they are transported and locations of processing plants</li> <li>- discuss how the main raw materials are extracted by the open-pit or underground method</li> <li>- discuss how iron and alumina are produced</li> <li>- discuss the three steel making processes: <ul style="list-style-type: none"> <li>- basic oxygen</li> <li>- open hearth</li> <li>- electric</li> </ul> </li> <li>- identify the elements commonly alloyed with steel and aluminum</li> <li>- discuss the characteristics the alloying elements imparts to steel and aluminum: <ul style="list-style-type: none"> <li>- toughness</li> <li>- hardness</li> <li>- strength</li> <li>- wear resistance</li> </ul> </li> </ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS  
(continued)

IEMMM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>3. Identification:</p> <ul style="list-style-type: none"> <li>- properties</li> <li>- testing</li> <li>- standard shapes and sizes</li> </ul>	<ul style="list-style-type: none"> <li>- discuss the basic properties of common ferrous and non-ferrous metals</li> <li>- perform simple tests on ferrous and non-ferrous metals for identification, such as: <ul style="list-style-type: none"> <li>- spark</li> <li>- hardness</li> <li>- flexibility</li> <li>- tensile</li> </ul> </li> <li>- identify the various shapes and sizes in which ferrous and non-ferrous metals are available, such as: <ul style="list-style-type: none"> <li>- sheet</li> <li>- plate</li> <li>- band</li> <li>- rod</li> <li>- square</li> <li>- flats</li> <li>- hexagonal</li> <li>- octagonal</li> <li>- angle</li> <li>- channel</li> <li>- I-beam</li> </ul> </li> </ul>		

NOTES:

TOPIC 3: PRODUCT PLANNING AND DESIGN

IEMMM

GENERALIZATION: Product planning and design is an integral part of the production process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Planning:</p> <ul style="list-style-type: none"> <li>- design</li> <li>- measurement</li> <li>- layout</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- discuss and list elements of design, such as: <ul style="list-style-type: none"> <li>- line</li> <li>- color</li> <li>- form</li> <li>- material</li> <li>- movement</li> </ul> </li> <li>- discuss and list principles of design, such as: <ul style="list-style-type: none"> <li>- balance</li> <li>- harmony</li> <li>- scale</li> <li>- practicality</li> </ul> </li> <li>- read and interpret technical drawings</li> <li>- use technical drawings for products being fabricated</li> <li>- use SI Metric system in product planning and development</li> <li>- use the following layout and measuring tools in product development: <ul style="list-style-type: none"> <li>- rules</li> <li>- square</li> <li>- scribe</li> <li>- dividers</li> <li>- prick punch</li> <li>- centre punch</li> <li>- caliper</li> <li>- micrometer or vernier caliper</li> <li>- surface gauge</li> <li>- protractor</li> </ul> </li> </ul>		

TOPIC 4: SHAPING PROCESSES

IEMMM

GENERALIZATION: Metal stock can be shaped into useful products by removing, combining and forming processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Separation:</p> <ul style="list-style-type: none"><li>- chip removal</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- use the following tools and machines safely:<ul style="list-style-type: none"><li>- hacksaw</li><li>- power bandsaw and hacksaw</li><li>- hand drill</li><li>- drill press</li><li>- hand reamers</li><li>- taps and dies</li><li>- files</li><li>- grinder</li><li>- engine lathe</li><li>- shaper</li><li>- milling machine</li></ul></li></ul>		
<p>2. Forming:</p> <ul style="list-style-type: none"><li>- forging</li></ul>	<ul style="list-style-type: none"><li>- discuss hand forging and use the following tools and equipment in product development:<ul style="list-style-type: none"><li>- forge</li><li>- anvil</li><li>- tongs</li><li>- ball peen hammer</li><li>- hardies</li><li>- swages</li><li>- forging chisels and punches</li></ul></li></ul>		
<p>3. Conditioning:</p> <ul style="list-style-type: none"><li>- heat</li></ul>	<ul style="list-style-type: none"><li>- discuss and use the following processes in product development:<ul style="list-style-type: none"><li>- hardening and tempering</li></ul></li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEMMM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Combining:  - fasteners	<ul style="list-style-type: none"><li>- identify the most common threads used in industry</li><li>- discuss the procedures for cutting internal and external threads using taps and dies</li><li>- cut threads in product development using taps and dies</li><li>- discuss the procedures for cutting internal and external threads using the engine lathe</li><li>- use the engine lathe to cut internal and external threads</li></ul>		

NOTES:

## MODULE NINE

### ARC WELDING

#### Introduction

Arc Welding is of major importance in industry in the assembly of products and components.

#### Objectives

The objectives of the Arc Welding module are to:

1. Introduce the student to generalizations and concepts that are common to industry and apply them to Arc Welding.
2. Provide the student with an opportunity to explore processes employed in the arc welding industry.
3. Develop in the student an awareness of the major occupations in the related career fields.

#### Learning Resources

\*Pender, James A., Welding, 2nd Edition, McGraw-Hill Ryerson, 1978.

Althouse, Andrew D., et al., Modern Welding, Goodheart-Willcox, 1976.

Feirer, John L. General Metals, 3rd Edition, McGraw-Hill Ryerson, 1976.

Kennedy, Gower A., Welding Technology, H.W. Sams Publications, 1974.

Walker, John R., Arc Welding: Basic Fundamentals, Goodheart-Willcox, 1973.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMAW

GENERALIZATION: Students should develop attitudes of safety and observe safe procedures when working with tools, machines and equipment in the laboratory.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	<p>The student will:</p> <ul style="list-style-type: none"><li>- identify and list acts and conditions which could cause injury in relation to tools and equipment, such as:<ul style="list-style-type: none"><li>- hand tools</li><li>- power tools</li><li>- hot metals</li></ul></li></ul>		
2. Accident Reports	<ul style="list-style-type: none"><li>- explain purpose and use of accident report forms and report all accidents</li></ul>		
3. Compensation	<ul style="list-style-type: none"><li>- explain the function of and benefits available under the Workers' Compensation Act</li></ul>		
4. Safety Program	<ul style="list-style-type: none"><li>- participate in the prescribed safety program of the lab and/or school system</li><li>- use appropriate safety apparel at all times</li><li>- discuss the following as they relate to the welding area:<ul style="list-style-type: none"><li>- fire prevention</li><li>- ventilation</li><li>- electrical safety</li></ul></li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS

IEMAW

GENERALIZATION: Raw materials must be extracted and processed in order to produce materials of standard size and quality which can be used for manufacturing useful products and components.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources:</p> <ul style="list-style-type: none"><li>- location</li><li>- extraction</li></ul> <p>2. Processing:</p> <ul style="list-style-type: none"><li>- refining/ converting</li><li>- alloying</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- discuss the locations of iron ore and bauxite, how they are transported and locations of processing plants</li><li>- discuss how the main raw materials are extracted by the open-pit or underground method</li><li>- discuss how iron is produced</li><li>- discuss the three steel making processes:<ul style="list-style-type: none"><li>- basic oxygen</li><li>- open hearth</li><li>- electric</li></ul></li><li>- identify the elements commonly alloyed with steel</li><li>- discuss the characteristics the alloying elements imparts to steel:<ul style="list-style-type: none"><li>- toughness</li><li>- hardness</li><li>- strength</li><li>- wear resistance</li></ul></li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS  
(continued)

IEMAW

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>3. Identification:</p> <ul style="list-style-type: none"><li>- properties</li><li>- testing</li><li>- standard shapes and sizes</li></ul>	<ul style="list-style-type: none"><li>- discuss the basic properties of common ferrous and non-ferrous metals</li><li>- perform simple test on ferrous and non-ferrous metals for identification, such as:<ul style="list-style-type: none"><li>- spark</li><li>- hardness</li><li>- flexibility</li><li>- tensile</li></ul></li><li>- identify the various shapes and sizes in which ferrous and non-ferrous metals are available, such as:<ul style="list-style-type: none"><li>- sheet</li><li>- plate</li><li>- band</li><li>- rod</li><li>- square</li><li>- flats</li><li>- hexagonal</li><li>- octagonal</li><li>- angle</li><li>- channel</li><li>- I-beam</li></ul></li></ul>		

NOTES:

TOPIC 3: PRODUCT PLANNING AND DESIGN

IEMAW

GENERALIZATION: Product planning and design is an integral part of the production process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Planning:</p> <ul style="list-style-type: none"><li>- design</li><li>- measurement</li><li>- layout</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- discuss and list elements of design, such as:<ul style="list-style-type: none"><li>- line</li><li>- color</li><li>- form</li><li>- material</li><li>- movement</li></ul></li><li>- discuss and list principles of design, such as:<ul style="list-style-type: none"><li>- balance</li><li>- harmony</li><li>- scale</li><li>- practicality</li></ul></li><li>- read and interpret technical drawings</li><li>- use technical drawings for products being fabricated</li><li>- use SI Metric system in product planning and development</li><li>- use the following layout and measuring tools in product development:<ul style="list-style-type: none"><li>- rules</li><li>- square</li><li>- scribe</li><li>- dividers</li><li>- calipers</li><li>- protractor</li></ul></li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES

IEMAW

GENERALIZATION: Sheet metal stock can be shaped into useful products by removing, combining and forming processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Separation:</p> <ul style="list-style-type: none"> <li>- chip removal</li> <li>- non-chip removal</li> </ul> <p>2. Fastening:</p> <ul style="list-style-type: none"> <li>- cohesion</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- use the following tools safely: <ul style="list-style-type: none"> <li>- power handsaw/hacksaw</li> <li>- hand drill</li> <li>- drill press</li> <li>- punches</li> <li>- grinder</li> </ul> </li> <li>- use the following tools safely: <ul style="list-style-type: none"> <li>- snips</li> <li>- squaring shears</li> <li>- notcher</li> <li>- chisels</li> </ul> </li> <li>- describe the electric arc welding process</li> <li>- describe straight and reverse polarity</li> <li>- describe the welding circuit in reference to volts, amps, burn-off rate and arc control</li> <li>- discuss the different electrodes used for mild steel welding</li> <li>- strike and maintain an arc</li> </ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEMAW

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	<ul style="list-style-type: none"> <li>- run parallel stringer and weave beads in the flat position with emphasis on the following:               <ul style="list-style-type: none"> <li>- position</li> <li>- arc length</li> <li>- electrode angle</li> <li>- speed of travel</li> </ul> </li> <li>- prepare metal and weld in the flat position the following joints:               <ul style="list-style-type: none"> <li>- butt</li> <li>- lap</li> <li>- outside corner</li> <li>- tee</li> </ul> </li> <li>- demonstrate how to restart a weld</li> <li>- demonstrate how to end a weld</li> <li>- select and make a product employing one or more of the above joints</li> <li>- carry out a destructive test on a weld</li> <li>- identify the following problems in relation to welds and discuss solutions:               <ul style="list-style-type: none"> <li>- poor appearance</li> <li>- poor fusion</li> <li>- undercutting</li> <li>- poor penetration</li> <li>- warping</li> <li>- distortion</li> <li>- cracks</li> <li>- excessive splatter</li> <li>- arc hard to start</li> <li>- porous</li> <li>- slag inclusion</li> </ul> </li> </ul>		

MODULE TEN  
OXY-ACETYLENE WELDING

Introduction

Oxy-acetylene welding is of major importance in the assembling of products and components in industry.

Objectives

The objectives of the Oxy-acetylene Welding module are to:

1. Introduce the student to generalizations and concepts that are common to industry and apply them to oxy-acetylene welding.
2. Provide the student with an opportunity to explore processes employed in the oxy-acetylene welding.
3. Develop in the student an awareness of the major occupations in the related career fields.

Learning Resources

\*Pender, James A., Welding, 2nd Edition, McGraw-Hill Ryerson, 1978.

Althouse, Andrew D., et al., Modern Welding, Goodheart-Willcox, 1976.

Feirer, John L. General Metals, 3rd Edition, McGraw-Hill Ryerson, 1976.

Kennedy, Gower A., Welding Technology, H.W. Sams Publishing, 1978.

Walker, John R., Modern Metalworking, Goodheart-Willcox, 1973.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMOW

GENERALIZATION: Students should develop attitudes of safety and observe safe procedures when working with tools, machines and equipment in the laboratory.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Unsafe Acts and Unsafe Conditions</p> <p>2. Accident Reports</p> <p>3. Compensation</p> <p>4. Safety Program</p>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- identify and list acts and conditions which could cause injury in relation to tools and equipment, such as: <ul style="list-style-type: none"> <li>- hand tools</li> <li>- power tools</li> <li>- hot metals</li> </ul> </li> <li>- explain purpose and use of accident report forms and report all accidents</li> <li>- explain the function of and benefits available under the Workers' Compensation Act</li> <li>- participate in the prescribed safety program of the lab and/or school system</li> <li>- use appropriate safety apparel at all times</li> <li>- discuss the following as they relate to the welding area: <ul style="list-style-type: none"> <li>- fire prevention</li> <li>- ventilation</li> <li>- oxy-fuel</li> </ul> </li> </ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS

IEMOW

GENERALIZATION: Raw materials must be extracted and processed in order to produce materials of standard size and quality which can be used for manufacturing useful products and components.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources:</p> <ul style="list-style-type: none"><li>- location</li><li>- extraction</li></ul> <p>2. Processing:</p> <ul style="list-style-type: none"><li>- refining/ converting</li><li>- alloying</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- discuss the locations of iron ore and bauxite, how they are transported and locations of processing plants</li><li>- discuss how the main raw materials are extracted by the open-pit or underground method</li><li>- discuss how iron is produced</li><li>- identify the three steel making processes:<ul style="list-style-type: none"><li>- basic oxygen</li><li>- open hearth</li><li>- electric</li></ul></li><li>- identify the elements commonly alloyed with steel</li><li>- discuss the characteristics the alloying elements imparts to steel:<ul style="list-style-type: none"><li>- toughness</li><li>- hardness</li><li>- strength</li><li>- wear resistance</li></ul></li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING OF RAW MATERIALS  
(continued)

IEMOW

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
3. Identification: <ul style="list-style-type: none"><li>- properties</li><li>- testing</li><li>- standard shapes and sizes</li></ul>	<ul style="list-style-type: none"><li>- discuss the basic properties of common ferrous and non-ferrous metals</li><li>- perform simple test on ferrous and non-ferrous metals for identification, such as:<ul style="list-style-type: none"><li>- spark</li><li>- hardness</li><li>- flexibility</li><li>- tensile</li></ul></li><li>- identify the various shapes and sizes in which ferrous and non-ferrous metals are available, such as:<ul style="list-style-type: none"><li>- sheet</li><li>- plate</li><li>- band</li><li>- rod</li><li>- square</li><li>- flats</li><li>- hexagonal</li><li>- octagonal</li><li>- angle</li><li>- channel</li><li>- I-beam</li></ul></li></ul>		

NOTES:

TOPIC 3: PRODUCT PLANNING AND DESIGN

IEMOW

GENERALIZATION: Product planning and design is an integral part of the production process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Planning:</p> <ul style="list-style-type: none"> <li>- design</li> <li>- measurement</li> <li>- layout</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- discuss and list elements of design, such as: <ul style="list-style-type: none"> <li>- line</li> <li>- color</li> <li>- form</li> <li>- material</li> <li>- movement</li> </ul> </li> <li>- discuss and list principles of design, such as: <ul style="list-style-type: none"> <li>- balance</li> <li>- harmony</li> <li>- scale</li> <li>- practicality</li> </ul> </li> <li>- read and interpret technical drawings</li> <li>- use technical drawings for products being fabricated</li> <li>- use SI Metric system in product planning and development</li> <li>- use the following layout and measuring tools in product development: <ul style="list-style-type: none"> <li>- rules</li> <li>- square</li> <li>- scribe</li> <li>- dividers</li> <li>- prick punch</li> <li>- centre punch</li> <li>- calipers</li> <li>- protractor</li> </ul> </li> </ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES

IEMOW

GENERALIZATION: Sheet metal stock can be shaped into useful products by removing, combining and forming processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Separation:</p> <ul style="list-style-type: none"><li>- chip removal</li><li>- non-chip removal</li></ul> <p>2. Fastening:</p> <ul style="list-style-type: none"><li>- cohesion</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- use the following tools safely:<ul style="list-style-type: none"><li>- power handsaw</li><li>- hacksaw</li><li>- hand drill</li><li>- drill press</li><li>- punches</li><li>- grinder</li></ul></li><li>- use the following tools safely:<ul style="list-style-type: none"><li>- snips</li><li>- squaring shears</li><li>- notcher</li><li>- chisels</li></ul></li><li>- light and adjust a pre-heat flame</li><li>- discuss flame cutting procedure</li><li>- perform straight cutting and piercing</li><li>- demonstrate basic knowledge in use of oxy-acetylene equipment, such as:<ul style="list-style-type: none"><li>- cylinders</li><li>- regulators</li><li>- hoses</li><li>- tips</li><li>- torches</li></ul></li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEMOW

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	<ul style="list-style-type: none"><li>- demonstrate safe procedures in start up and shut down of equipment</li><li>- demonstrate correct procedure for setting pressure and adjusting flame</li><li>- discuss the types of filler rods used in oxy-acetylene welding</li><li>- run a straight bead in the flat position without a filler rod</li><li>- weld in the flat position the following joints:<ul style="list-style-type: none"><li>- butt</li><li>- lap</li><li>- outside corner</li><li>- tee</li></ul></li><li>- select and make a product using one or more of the above joints</li><li>- identify the following problems in relation to welds and discuss how to solve them:<ul style="list-style-type: none"><li>- poor appearance</li><li>- poor fusion</li><li>- undercutting</li><li>- poor penetration</li><li>- warping</li><li>- distortion</li></ul></li><li>- conduct a destructive test on a welded joint</li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEMOW

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- adhesion	<ul style="list-style-type: none"><li>- explain when metal is too hot or too cold for braze welding</li><li>- discuss the use of flux when braze welding</li><li>- run a straight braze weld bead in the flat position</li><li>- braze weld, in the flat position, the following joints:<ul style="list-style-type: none"><li>- lap</li><li>- tee</li></ul></li></ul>		

NOTES:

## MODULE ELEVEN

### FOUNDRY

#### Introduction

Foundry is an important metal working technique in our productive society. Casting is the metal forming process that is used to produce many products and components.

#### Objectives

The objectives for the Foundry module are to:

1. Introduce the student to generalizations and concepts that are common to industry and relate them to foundry.
2. Provide the student with an opportunity to explore occupations employed in foundry.
3. Develop in the student an awareness of the major occupations in the related career fields.

#### Learning Resources

\*Smith, Robert E., Patternmaking and Founding, McKnight Publishing Co., 1954.

Cowles, Fred T. An Elementary Foundry Manual, McEnglevan, Danville, 1954.

Feirer, John L. General Metals, 3rd Edition, McGraw-Hill Ryerson, 1976.

Walker, John R., Modern Metalworking, Goodheart-Willcox, 1973.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMF

GENERALIZATION: Students should develop attitudes of safety and observe safe procedures when working with tools and equipment in the foundry area.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	The student will: <ul style="list-style-type: none"><li>- identify and list acts and conditions which could cause injury in relation to tools and equipment, such as:<ul style="list-style-type: none"><li>- hand tools</li><li>- power tools</li><li>- hot metals</li></ul></li></ul>		
2. Accident Reports	<ul style="list-style-type: none"><li>- explain purpose and use of accident report forms and report all accidents</li></ul>		
3. Compensation	<ul style="list-style-type: none"><li>- explain the function of and benefits available under the Workers' Compensation Act</li></ul>		
4. Safety Program	<ul style="list-style-type: none"><li>- participate in the prescribed safety program of the lab and/or school system</li><li>- use appropriate safety apparel at all times</li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING RAW MATERIALS

IEMF

GENERALIZATION: Raw materials must be processed, conditioned and shaped before they are utilized in the manufacture of components for products.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources:</p> <ul style="list-style-type: none"><li>- location</li></ul> <p>2. Processing:</p> <ul style="list-style-type: none"><li>- refining/ converting</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- list the location in Canada where bauxite can be found</li><li>- describe how bauxite is transported to the processing plants</li><li>- explain briefly how bauxite is extracted by the open-pit or underground method</li><li>- describe how alumina is produced</li><li>- explain the aluminum smelting process</li><li>- identify the elements commonly alloyed with aluminum</li><li>- discuss the characteristics the alloying elements imparts to aluminum:<ul style="list-style-type: none"><li>- toughness</li><li>- hardness</li><li>- strength</li><li>- wear resistance</li></ul></li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING RAW MATERIALS  
(continued)

IEMF

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
3. Identification: <ul style="list-style-type: none"><li>- properties</li><li>- testing</li></ul>	<ul style="list-style-type: none"><li>- list the basic properties of aluminum and brass</li><li>- perform simple tests to identify different metals, such as:<ul style="list-style-type: none"><li>- sight</li><li>- spark</li><li>- magnetic</li></ul></li></ul>		

TOPIC 3: PRODUCT PLANNING AND DESIGN

IEMF

GENERALIZATION: Product planning and design is an integral element of the production process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Planning: <ul style="list-style-type: none"><li>- design</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- discuss and list elements of design, such as:<ul style="list-style-type: none"><li>- line</li><li>- color</li><li>- form</li><li>- material</li><li>- movement</li></ul></li><li>- discuss and list principles of design, such as:<ul style="list-style-type: none"><li>- balance</li><li>- harmony</li><li>- scale</li><li>- practicality</li></ul></li></ul>		

TOPIC 3: PRODUCT PLANNING AND DESIGN (continued)

IEMF

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"><li>- measurement</li><li>- layout</li></ul>	<ul style="list-style-type: none"><li>- read and interpret technical drawings</li><li>- use technical drawings for products being fabricated</li><li>- use SI metric system in product planning and development</li><li>- use the following layout and measuring tools in product development:<ul style="list-style-type: none"><li>- rules</li><li>- square</li><li>- scribe</li><li>- dividers</li><li>- trammel</li><li>- calipers</li><li>- protractor</li></ul></li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES

IEMF

GENERALIZATION: Metals may be shaped into useful products by forming processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Forming:</p> <ul style="list-style-type: none"><li>- casting</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- discuss the following casting methods commonly used in industry:<ul style="list-style-type: none"><li>- sand</li><li>- plaster mold</li><li>- die</li><li>- permanent mold</li><li>- investment</li><li>- shell mold</li><li>- centrifugal</li></ul></li><li>- identify and discuss the properties of core and moulding sands</li><li>- use the following tools and equipment when casting products:<ul style="list-style-type: none"><li>- cope and drag</li><li>- bench hammer</li><li>- riddle</li><li>- molders bulb</li><li>- bellows</li><li>- spoon and gate cutter</li><li>- trowel</li><li>- lifter</li><li>- molding board</li><li>- bottom board</li><li>- strike off bar</li><li>- slick and oval</li></ul></li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEMF

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	<ul style="list-style-type: none"><li>- identify the three basic qualities which molding sand must possess: withstand heat of molten metal, hold shape of mold cavity and be porous enough to permit gases to escape</li><li>- correctly temper molding sand</li><li>- make a sand core</li><li>- prepare molds for the following types of pattern:<ul style="list-style-type: none"><li>- simple</li><li>- split</li><li>- requiring a sand core</li></ul></li><li>- construct a pattern using the principles of pattern making:<ul style="list-style-type: none"><li>- shrink rule</li><li>- draft</li><li>- fillets</li></ul></li><li>- describe the operation of the furnace and list the main parts</li><li>- set up and correctly light the furnace</li><li>- melt aluminum and use a pyrometer correctly</li><li>- pour a casting</li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEMF

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Finishing:  - texturing  - coating  - polishing	<ul style="list-style-type: none"><li>- describe how to remove the parting line from a casting</li><li>- finish casting by using methods, such as:<ul style="list-style-type: none"><li>- brushing</li><li>- sand blasting</li><li>- peening</li></ul></li><li>- finish casting by:<ul style="list-style-type: none"><li>- painting</li><li>- enameling</li></ul></li><li>- use the buffer to polish castings</li></ul>		

NOTES:

## MODULE TWELVE

### EARTHS

#### Introduction

Earths, some of the oldest materials used by man, continue to play an important role in modern industry.

#### Objectives

The objectives of the Earths module are to:

1. Introduce the student to generalizations and concepts that are common to industry and relate them to the earths industry.
2. Provide the student with an opportunity to explore processes employed in the earths industry.
3. Develop in the student an awareness of the major occupations in the related career fields.

#### Learning Resources

\*Brennan, T.J., Ceramics, Goodheart-Willcox, Latest Edition.

Chaney, C. et al., Plaster Mold and Model Making,  
Van Nostrand Reinhold, Latest Edition.

Seeley, V.C. and Thompson, R.L. Activities in Ceramics,  
McKnight Publishing Co., Latest Edition.

Canadian Portland Cement Association, Design and Control of Concrete,  
Ottawa.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEME

GENERALIZATION: Students should develop attitudes of safety and observe safe procedures when working with tools, machines and equipment in the laboratory.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	The student will: <ul style="list-style-type: none"><li>- identify and list acts and conditions which could cause injury in relation to tools and equipment, such as:<ul style="list-style-type: none"><li>- hand tools</li><li>- power</li></ul></li></ul>		
2. Accident Reports	<ul style="list-style-type: none"><li>- explain purpose and use of accident report forms and report all accidents</li></ul>		
3. Compensation	<ul style="list-style-type: none"><li>- explain the function of and benefits available under the Workers' Compensation Act</li></ul>		
4. Safety Program	<ul style="list-style-type: none"><li>- participate in the prescribed safety program of the lab and/or school system</li><li>- use appropriate safety apparel at all times</li></ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING RAW MATERIALS

TEME

GENERALIZATION: Raw materials must be processed in order to produce materials which can be used in the manufacture of useful products.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Sources:</p> <ul style="list-style-type: none"> <li>- location</li> <li>- extraction</li> </ul> <p>2. Processing:</p> <ul style="list-style-type: none"> <li>- refining/ converting</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- list the location in clay, limestone, silica, sand and gravel</li> <li>- discuss the transportation of these materials to processing plants</li> <li>- identify the locations of various processing plants</li> <li>- describe how the main raw materials are extracted by the open-pit or underground method</li> <li>- describe how Portland cement is manufactured</li> <li>- identify the common types of Portland cement</li> <li>- describe the types of aggregate based on: <ul style="list-style-type: none"> <li>- standard tests</li> <li>- desirable characteristics</li> <li>- gradation</li> </ul> </li> <li>- describe how glass is manufactured</li> </ul>		

NOTES:

TOPIC 2: EXTRACTION AND PROCESSING RAW MATERIALS  
(continued)

IEME

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
3. Identification:	<ul style="list-style-type: none"><li>- list the basic properties of the materials used in:<ul style="list-style-type: none"><li>- Portland cement</li><li>- concrete</li><li>- glass</li><li>- ceramic clays</li></ul></li><li>- perform simple tests to identify various materials used in Earths, such as:<ul style="list-style-type: none"><li>- sight</li><li>- hardness</li></ul></li></ul>		

TOPIC 3: PRODUCT PLANNING AND DESIGN

IEME

GENERALIZATION: Product planning and design is an integral element of the production process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Planning: <ul style="list-style-type: none"><li>- design</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- discuss and list elements of design, such as:<ul style="list-style-type: none"><li>- line</li><li>- color</li><li>- form</li><li>- material</li><li>- movement</li></ul></li></ul>		

NOTES:

TOPIC 3: PRODUCT PLANNING AND DESIGN (continued)

IEME

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"><li>- measurement</li><li>- layout</li></ul>	<ul style="list-style-type: none"><li>- discuss and list principles of design, such as:<ul style="list-style-type: none"><li>- balance</li><li>- harmony</li><li>- scale</li><li>- practicality</li></ul></li><li>- read and interpret technical drawings</li><li>- use technical drawings for products being fabricated</li><li>- use SI metric system in product planning and development</li><li>- use the following layout and measuring tools in product development:<ul style="list-style-type: none"><li>- rules</li><li>- square</li><li>- scribe</li><li>- dividers</li><li>- trammel</li><li>- calipers</li></ul></li></ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES

IEME

GENERALIZATION: The materials used in Earths can be shaped into useful products by removing, combining and forming processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Separation:</p> <ul style="list-style-type: none"> <li>- chip removal</li> <li>- non-chip removal</li> </ul> <p>2. Forming:</p> <ul style="list-style-type: none"> <li>- casting/ molding</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- identify and use chip removal tools, such as: <ul style="list-style-type: none"> <li>- knife</li> <li>- modeling tools</li> </ul> </li> <li>- identify and use non-chip removal tools, such as: <ul style="list-style-type: none"> <li>- wire</li> <li>- spatula</li> </ul> </li> <li>- discuss the procedures used for slip casting</li> <li>- make a clay product utilizing the slipcasting process</li> <li>- discuss the procedures for making a plaster piece mold</li> <li>- make a piece mold of a suitable object and use the mold to make a slip casting</li> <li>- discuss the procedure for measuring and mixing concrete</li> <li>- mix concrete and use a mold to cast a product, such as: <ul style="list-style-type: none"> <li>- patio block</li> <li>- section of sidewalk</li> </ul> </li> <li>- construct a form and cast a concrete product</li> </ul>		

NOTES:

TOPIC 4: SHAPING PROCESSES (continued)

IEME

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>3. Combining:</p> <ul style="list-style-type: none"> <li>- cohesion</li> <li>- adhesion</li> <li>- coating</li> </ul> <p>4. Conditioning:</p> <ul style="list-style-type: none"> <li>- heat</li> <li>- water</li> </ul>	<ul style="list-style-type: none"> <li>- discuss and use the correct adhesive, e.g. cement in concrete, for the type of materials to be bonded</li> <li>- discuss the procedure for attaching ceramic tile to floors and walls</li> <li>- cut ceramic tile and attach to walls and floors using correct adhesive, e.g. epoxy</li> <li>- discuss the use of different grout and apply grout to tiled surface</li> <li>- discuss types and purposes of various undercoatings for ceramic and concrete products</li> <li>- use glazes on various ceramic products</li> <li>- use paints on various concrete products</li> <li>- discuss how the kiln is used in the ceramic firing process</li> <li>- stack and set up a kiln for: <ul style="list-style-type: none"> <li>- bisque firing greenware</li> <li>- glaze firing bisque</li> </ul> </li> <li>- discuss the appropriateness and use of water in conditioning clay and concrete for products</li> </ul>		

NOTES:

## MODULE THIRTEEN

### PLASTICS

#### Introduction

The role of plastics in our society has expanded tremendously since its relatively recent development to a level that affirms the field of plastics as one of our most spectacular growth industries. Knowledgeable sources have estimated that the volume of plastics used for all purposes will surpass the volume of metals used by the mid-1980's.

#### Objectives

The objectives of the Plastics module are to:

1. Provide the student with experience in the classification and identification of plastic materials.
2. Develop a basic understanding of plastics extraction and processing techniques.
3. Introduce the student to methods and processes employed to form, shape and fabricate products from plastics.

#### Learning Resources

- \*Cherry, Raymond, General Plastics, McKnight Publishing, 1969.
- Baird, Ronald J., Industrial Plastics, Goodheart-Willcox, 1971.
- Cope, Dwight W., Cope's Plastics Book, Goodheart-Willcox, 1973.
- Milby, R.V., Plastics Technology, McGraw-Hill Ryerson, 1973.
- Richardson, T.A., Modern Industrial Plastics, Howard W. Sams, Latest Edition.

\*Refers to prescribed learning resources.

TOPIC 1: SAFETY

IEMP

GENERALIZATION: Students should develop and demonstrate a knowledge of safe tool, equipment and material use.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	The student will: <ul style="list-style-type: none"><li>- identify, analyze and evaluate unsafe acts and conditions with relation to tools, machines, materials and processes</li></ul>		
2. Safety Program	<ul style="list-style-type: none"><li>- participate in a prescribed safety program</li><li>- practise safe habits in work procedures including use of applicable safety apparel</li></ul>		
3. Accident Report Procedures	<ul style="list-style-type: none"><li>- explain the purpose of prompt reporting and recording of accidents</li><li>- explain why it is desirable to provide prompt treatment to injuries</li></ul>		

NOTES:

TOPIC 2: SOURCES AND PROCESSING

IEMP

GENERALIZATION: Raw materials must be located, processed and made available for use.

CONCEPTS/SURCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Location  2. Extraction  3. Processing	The student will: <ul style="list-style-type: none"><li>- list the sources of plastics materials and their origin from the by-product industry</li><li>- explain the derivation of plastics from petroleum</li><li>- explain the basic principles utilized in the refining process to produce plastics from base materials</li><li>- discuss how plastics are developed by recombining elements</li></ul>		

TOPIC 3: CLASSIFICATION AND CHARACTERISTICS

IEMP

GENERALIZATION: Students need a basis for assessing the suitability of different plastic materials for utilization in various products.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Classification	The student will: <ul style="list-style-type: none"><li>- explain the differences in the two basic types of plastics:<ul style="list-style-type: none"><li>- thermosets</li><li>- thermoforming</li></ul></li></ul>		

TOPIC 3: CLASSIFICATION AND CHARACTERISTICS  
(continued)

IEMP

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Properties	<ul style="list-style-type: none"> <li>- explain the characteristics of plastic materials, such as: <ul style="list-style-type: none"> <li>- movement</li> <li>- softness</li> <li>- impact strength</li> <li>- insulation properties</li> <li>- resiliency</li> <li>- temperature resistance</li> <li>- chemical resistance</li> <li>- friction effect</li> <li>- elasticity</li> </ul> </li> </ul>		
3. Testing	<ul style="list-style-type: none"> <li>- perform simple tests on plastic materials, such as: <ul style="list-style-type: none"> <li>- destructive</li> <li>- non-destructive</li> <li>- heat</li> <li>- chemical</li> </ul> </li> </ul>		
4. Type or Kinds	<ul style="list-style-type: none"> <li>- discuss types of plastics, such as: <ul style="list-style-type: none"> <li>- acrylics</li> <li>- polyesters</li> <li>- phenolics</li> <li>- ethylenes</li> <li>- epoxies</li> <li>- styrenes</li> <li>- melanines</li> <li>- ureas</li> <li>- nylons</li> <li>- methones</li> <li>- silicones</li> </ul> </li> </ul>		
5. Physical Forms	<ul style="list-style-type: none"> <li>- identify the different forms in which plastic is available: <ul style="list-style-type: none"> <li>- sheet</li> <li>- film</li> <li>- liquids (resins)</li> <li>- pellets</li> <li>- powder</li> <li>- beads</li> <li>- etc.</li> </ul> </li> </ul>		

TOPIC 4: SHAPING, MOLDING AND FABRICATING

IEMP

GENERALIZATION: Students should become cognizant of the varied methods and procedures which may be employed when utilizing plastics materials.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Shaping	<p>The student will:</p> <ul style="list-style-type: none"><li>- describe the methods employed to form plastic materials by:<ul style="list-style-type: none"><li>- chip removal or separating tools</li><li>- abrading</li><li>- shearing</li><li>- heating</li><li>- turning</li><li>- drilling</li></ul></li></ul>		
3. Molding	<ul style="list-style-type: none"><li>- explain the many molding methods used in forming plastic materials:<ul style="list-style-type: none"><li>- injection</li><li>- rotational</li><li>- compression</li><li>- blow</li><li>- casting</li><li>- dipping</li><li>- expansion</li><li>- vacuum</li><li>- foaming</li><li>- extrusion</li><li>- thermoforming</li><li>- thermofusion</li><li>- roll forming</li></ul></li></ul>		
3. Fabricating and Combining	<ul style="list-style-type: none"><li>- describe methods of fabricating and bonding plastics in industry:<ul style="list-style-type: none"><li>- chemical welding</li><li>- hot air welding</li><li>- lamination by utilizing heat and pressure</li><li>- mechanical fastening</li></ul></li></ul>		

NOTES:

TOPIC 4: SHAPING, MOLDING AND FABRICATING (continued)

IEMP

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Finishing	<ul style="list-style-type: none"><li>- apply various finishing techniques to plastic materials, such as:<ul style="list-style-type: none"><li>- buffing</li><li>- polishing</li><li>- solvent polishing</li><li>- coating and decorating</li></ul></li></ul>		

NOTES:

## MODULE FOURTEEN

### TEXTILES

#### Introduction

The study of textiles will give an intelligent appraisal of standards and brands of merchandise, an ability to distinguish quality in fabric and an understanding of the proper use of different qualities.

The historical and cultural associations as well as the handling of fabrics becomes a fascinating study, from the source of the raw materials to the way in which the materials are processed and the products distributed.

As a result of this study, the consumer-merchant and the consumer-customer will know how to buy and what to buy. It is important that students have products to handle and compare.

#### Objectives

The objectives of the Textiles module are to:

1. Develop student knowledge of and interest in textiles.
2. Provide the student with an opportunity to use and maintain sewing equipment.
3. Provide the student with information about occupational opportunities in the textile field.

#### Learning Resources

Craig, H.T., Clothing: A Comprehensive Study, McClelland and Stewart, 1973.

Graef, Judy L., Strom, Joan B., Concepts in Clothing, Webster Div. McGraw-Hill Book Co.

McCalls and Simplicity Learn to Sew Books.

Readers Digest Complete Guide to Sewing.

Sewing Machine Manuals.

TOPIC 1: SAFETY

IEMT

GENERALIZATION: The development and demonstration of student knowledge in safe tool, equipment and material use is important in the industrial education program.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none"><li>- recognize unsafe acts and unsafe conditions</li><li>- identify and list factors affecting safety in the work environment such as:<ul style="list-style-type: none"><li>- dress and clothing requirements</li><li>- location and use of fire extinguishers</li><li>- storage of materials and supplies</li><li>- student behavior</li></ul></li></ul>		
2. Safety Program	<ul style="list-style-type: none"><li>- participate in implementation of a safety program for the work environment</li></ul>		
3. Safe Work Habits and Tool Operations	<ul style="list-style-type: none"><li>- use tools and equipment in a safe manner</li></ul>		
4. Accident Reports	<ul style="list-style-type: none"><li>- identify the purpose of Accident report forms and follow the correct procedures for reporting accidents</li></ul>		
5. Compensation	<ul style="list-style-type: none"><li>- explain the basic function of benefits under the Workers' Compensation Act</li></ul>		

NOTES:

TOPIC 2: TYPES OF FABRIC

IEMT

GENERALIZATION: Man uses many types of fabric for clothing ranging from natural to synthetic.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Textiles:</p> <ul style="list-style-type: none"><li>- natural</li><li>- synthetic</li><li>- testing</li><li>- yarns</li><li>- weaves</li></ul>	<p>The student will:</p> <ul style="list-style-type: none"><li>- list a variety of natural fabrics used in textiles and explain:<ul style="list-style-type: none"><li>- origin of the material</li><li>- method of manufacturing the fabric</li></ul></li><li>- list a variety of common synthetic fabrics and explain how specific fabrics are manufactured</li><li>- test various fabrics for:<ul style="list-style-type: none"><li>- strength</li><li>- absorption</li><li>- color fastness</li><li>- washability</li><li>- heat conductivity</li><li>- reaction to acids and alkali</li><li>- crease resistance</li><li>- water repellence</li></ul></li><li>- explain how yarns differ in thread count and twist</li><li>- explain the effect of weave on the durability of a fabric</li></ul>		

NOTES:

TOPIC 3: CLOTHING SELECTION, CARE AND CONSTRUCTION

IEMT

GENERALIZATION: To care for clothing and plan a functional and economic wardrobe requires knowledge of fabrics and basic garment construction.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Personal Clothing:</p> <ul style="list-style-type: none"> <li>- selecting</li> <li>- care</li> <li>- construction</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- discuss the information listed on various clothing labels</li> <li>- compare store and catalogue standards for clothing</li> <li>- compare costs of ready-made clothes with personal sewing</li> <li>- list clothing required for a personal wardrobe and calculate the approximate cost for the clothing</li> <li>- explain how to care for a variety of fabrics</li> <li>- demonstrate how to correctly: <ul style="list-style-type: none"> <li>- mend and press clothes</li> <li>- iron and fold clothes</li> <li>- press pants</li> <li>- launder socks and sweaters</li> </ul> </li> <li>- use marking out and measuring tools, hand tools and sewing machine in the construction of items, such as: <ul style="list-style-type: none"> <li>- lined skirt or jumper</li> <li>- blouse with set in sleeve</li> <li>- dress</li> <li>- apron</li> <li>- cap</li> <li>- game bag</li> <li>- poncho</li> <li>- slip cover</li> <li>- pup tent</li> </ul> </li> </ul>		

## MODULE FIFTEEN

### FOODS

#### Introduction

To protect ones health and build an efficient body, one needs to give thought to diet. One must be aware of nutritional needs and how to select and prepare foods to meet these needs.

#### Objectives

The objectives of the Foods module are to:

1. Practise safety and sanitation in the kitchen.
2. Develop and maintain good food habits.
3. Develop judgement as to the reliability of health information (fads or facts).
4. Prepare a simple meal.
5. Acquire working knowledge of cooking terms.
6. Become aware of vocational opportunities in the food services industry.

#### Learning Resources

McDermott, Tritling, Nicholas & Meiklejohn, Food For Modern Living, (Canadian Edition) McClelland and Stewart.

Shank and Fitch, Guide To Modern Meals, (Canadian Edition), McGraw-Hill Ryerson.

TOPIC 1: SAFETY

IEMFO

GENERALIZATION: The development and demonstration of student knowledge in safe tool, equipment and material use is important in the industrial education program.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe Acts and Unsafe Conditions	<p>The student will:</p> <ul style="list-style-type: none"><li>- recognize unsafe acts and unsafe conditions</li><li>- identify and list factors affecting safety in the work environment such as:<ul style="list-style-type: none"><li>- dress and clothing requirements</li><li>- location and use of fire extinguishers</li><li>- storage of materials and supplies</li><li>- student behavior</li></ul></li></ul>		
2. Safety Program	<ul style="list-style-type: none"><li>- participate in implementation of a safety program for the work environment</li></ul>		
3. Safe Work Habits and Tool Operations	<ul style="list-style-type: none"><li>- use tools and equipment in a safe manner</li></ul>		
4. Accident Reports	<ul style="list-style-type: none"><li>- identify the purpose of Accident report forms and follow the correct procedures for reporting accidents</li></ul>		
5. Compensation	<ul style="list-style-type: none"><li>- explain the basic function of benefits under the Workers' Compensation Act</li></ul>		

NOTES:

TOPIC 2: SANITATION, NUTRITION, MANAGEMENT AND  
FOOD PREPARATION

IEMFO

GENERALIZATION: A knowledge of selection and preparation of foods is necessary to provide a balance of nutrients in the daily diet.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>The student will:</p> <p>1. Sanitation:</p> <ul style="list-style-type: none"> <li>- personal</li> <li>- equipment</li> <li>- food</li> </ul> <p>2. Nutrition</p> <p>3. Management:</p> <ul style="list-style-type: none"> <li>- terms</li> </ul>	<p>The student will:</p> <ul style="list-style-type: none"> <li>- explain why it is necessary to observe the following when handling and preparing foods: <ul style="list-style-type: none"> <li>- wear proper dress</li> <li>- have hair under control</li> <li>- have clean hands and nails</li> </ul> </li> <li>- describe how to establish a good system of dishwashing and of garbage disposal</li> <li>- describe the rules for safe storage of food</li> <li>- explain the reasons for pasturizing milk and having meats government inspected</li> <li>- use Canada's Food Guide to assist in listing foods which should be eaten during a twenty four hour period</li> <li>- plan a week's menu for a family of four with attention to the nutrients essential for growth, health and energy</li> <li>- list and explain a number of cooking terms</li> </ul>		

NOTES:

TOPIC 2: SANITATION, NUTRITION, MANAGEMENT AND  
FOOD PREPARATION (continued)

IEMFO

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"> <li>- measurement</li> <li>- budgeting</li> <li>- planning</li> </ul>	<ul style="list-style-type: none"> <li>- use the metric system of measurement and accurately measure the ingredients for a recipe</li> <li>- calculate the cost of a meal</li> <li>- compare the cost of ready mixed or prepared foods with the cost of home prepared foods</li> <li>- plan a work procedure for preparing a simple breakfast</li> </ul>		
4. Food Preparation:			
<ul style="list-style-type: none"> <li>- beverages</li> <li>- quick breads</li> <li>- eggs</li> <li>- vegetables and salads</li> </ul>	<ul style="list-style-type: none"> <li>- explain how to prepare and make beverages, such as: <ul style="list-style-type: none"> <li>- tea</li> <li>- coffee</li> <li>- cocoa</li> <li>- other</li> </ul> </li> <li>- explain how to make quick breads, such as: <ul style="list-style-type: none"> <li>- pancakes</li> <li>- waffles</li> </ul> </li> <li>- describe a number of methods for cooking eggs</li> <li>- describe a variety of ways for using vegetables in salads</li> <li>- explain how to cook specified vegetables</li> </ul>		

NOTES:

TOPIC 2: SANITATION, NUTRITION, MANAGEMENT AND  
FOOD PREPARATION (continued)

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CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"><li>- pasta and cheese</li><li>- fondue</li><li>- meat</li><li>- desserts and fruits</li><li>- meals</li></ul>	<ul style="list-style-type: none"><li>- explain how to cook macaroni and cheese</li><li>- explain how to prepare and cook a variety of items using a fondue</li><li>- identify common cuts of meat and explain how to:<ul style="list-style-type: none"><li>- tenderize meat</li><li>- prepare a specific meat dish</li><li>- make gravy</li></ul></li><li>- describe how to cook various fruits for a dessert</li><li>- explain how to prepare fruits for a fresh fruit dessert</li><li>- plan, cook and serve a full meal, such as:<ul style="list-style-type: none"><li>- breakfast</li><li>- lunch</li><li>- dinner</li></ul></li></ul>		

NOTES:

## GENERAL

### 1. Research Module

The purpose of the Research Module is to allow individual students to engage in an in-depth study of a problem related to any of the career fields.

The time period is 25 hours and qualifies as a regular module.

The module provides for individualizing the program to allow for special interests of students. The student should prepare a proposal of his/her research and have it approved by the teacher. The proposal should contain:

- a) A statement of the problem.
- b) The procedure to be followed in the research of the problem.
- c) A list of the materials and lab facilities to be used.
- d) A time line of activities.

### 2. Developmental Module

The purpose of the Developmental Module is to provide a 25-hour block of time for the teacher to try out new content with his/her class. The content of the proposal or project should be discussed with the Associate Director of Curriculum for the Practical Arts.

### 3. Production Science Module

The purpose of Production Science is to provide for a class project in setting up a company to produce a product or service.

The teacher may select content from the Production Science 30 curriculum guide. The Production Science 30 course will provide an outline from which content may be selected to develop a 25-hour module. The Production Science 30 is a full 4-5 credit course so the teacher must be selective in choosing the content for a module.



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